The Boeing Company
P O Box 3707
Seattle, WA 98124-2207

Boeing Everett
WAD041585464
HZW 6.6.25
Draft PCB sediment removal IA workplan
4/7/06

April 7, 2006
G-1241-YNG-093

Hand Delivered

Mr. Dean Yasuda
Environmental Engineer
Department of Ecology, NW Regional Office
3190 160th Avenue S.E.
Bellevue, Washington 98008-5452

Dear Mr. Yasuda:

BOEING

Subject: Boeing Everett – PMC Sediment Removal IA – Draft Engineering Design Report

As requested, I've enclosed 2 copies of the following:

- Draft Engineering Design Report, Powder Mill Creek, Sediment Removal Interim Action, BCA Everett Plant, prepared by URS Corporation, dated April 7, 2006.

If you have any questions, please call the undersigned

Sincerely,

Y. Nicholas Garson, P.G.
Project Manager
Boeing SSG Environmental Remediation
Cell Phone 425-269-7866

CC:

Brad Helland Ecology NWRO, TCP

URS

DRAFT
ENGINEERING DESIGN REPORT

POWDER MILL CREEK SEDIMENT REMOVAL INTERIM ACTION
BCA EVERETT PLANT

FOR
BOEING COMMERCIAL AIRPLANES
EVERETT, WASHINGTON

URS Job. No. 33758302
April 7, 2006

URS

April 7, 2006

Mr. Nick Garson, P.G.
The Boeing Company
SSG Environmental Remediation Group
P.O. Box 3707, MS 1W-12
Seattle, Washington 98124-2207

Draft
Engineering Design Report
Powder Mill Creek
Sediment Removal Interim Action
BCA Everett Plant
Everett, Washington
URS Job No.: 33758302

Dear Mr. Garson:

This Engineering Design Report presents the basis for design and site management plan, engineering specifications, and engineering drawings for the sediment removal Interim Action in Powder Mill Creek on the Boeing Commercial Airplanes Everett Plant property in Everett, Washington. These documents provide the data and information required for an Interim Action plan and design report under the Washington Model Toxics Control Act WAC 173-340-430(7) and WAC 173-240-400(4). A project specific health and safety plan will be developed and provided after approval of the Interim Action by the Washington Department of Ecology and prior to construction.

We trust this work plan meets Boeing and Ecology's current requirements. Please contact us should you have any questions regarding the information transmitted herein or require additional information.

Very truly yours,

URS CORPORATION

Mark P. Molinari
Principal Geologist, L.H. #351

Michael Meyer
Interim Action Task Manager

URS Corporation
1501 4th Avenue, Suite 1400
Seattle, WA 98101-1616
Tel: 206.438.2700
Fax: 206.438.2699

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FOR ENGINEERING DESIGN REPORT

DRAFT
BASIS OF DESIGN AND SITE MANAGEMENT PLAN POWDER MILL CREEK SEDIMENT REMOVAL INTERIM ACTION BCA EVERETT PLANT

FOR
BOEING COMMERCIAL AIRPLANES
EVERETT, WASHINGTON

URS Job. No. 33758302
April 7, 2006

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APPENDIX

1.0 INTRODUCTION

This document presents the basis of design and site management approach for implementing an Interim Action (IA) at Boeing Commercial Airplanes (BCA) Everett Plant in Everett, Washington (Figure 1). This IA consists of removal of sediments containing polychlorinated biphenyls (PCBs) within a specific portion of Powder Mill Creek (PMC) on Boeing property. It is being conducted pursuant to Agreed Order No. DE 96HS-N274, between The Boeing Company and the Washington Department of Ecology (Ecology). The effective date of this Agreed Order (AO) is February 12, 1997 and it was amended on October 22, 1998 and July 26, 2004. Ecology first requested this interim action informally during a meeting on June 15, 2005, and presented a formal request via a letter dated August 19, 2005. In the formal request, Ecology documented their determination that the IA will require an additional modification to the AO, which is in progress at the time of publication of this document. This document and the associated engineering specifications and drawings will be appended to the AO upon its approval and acceptance by Ecology.

This report, in combination with the IA design drawings and specifications constitutes the "report" required by the Washington State Model Toxics Control Act (MTCA) under WAC 173-340-430 prior to conducting interim actions. The package consisting of this report, the design drawings, and the specifications meet the content requirements in WAC 173-340-430(7). This package also meets the requirements for an "Engineering Design Report" for cleanup actions under WAC 173-340-400(4)(a).

The goals of this document are the following:

- Present the data and rationale used as a basis for the design of the sediment removal in Powder Mill Creek
- Present an approach to site management during design, construction, and initial maintenance of the sediment removal and creek restoration

Data analysis, engineering, and report preparation support for this document were provided to BCA by URS Corporation of Seattle, Washington.

1.1 DOCUMENT PURPOSE AND CONTENT

The purpose of this document is to:

- Provide the rationale for the sediment removal design shown in the design drawings and specifications
- Summarize the data that formed the basis for the design
- Describe the procedures used in the design

- Provide a narrative summary of the design
- Provide an updated project team contact list
- Provide procedures to be used during construction to manage the site, including health and safety, permitting, access and staging, traffic control, environmental protection, workflow, record documentation, and investigation-derived waste handling and disposition

To accomplish the above purpose, this document contains:

- The project objectives, relationship to other actions, project summary, and the organization and responsibility (Section 1.0)
- The site description and background (Section 2.0)
- The basis of design, including applicable and relevant and appropriate regulations, data sources, data summary, selection of removal limits, and stream restoration design process description (Section 3.0)
- Site management procedures (Section 4.0)
- Sampling and analysis during construction (Section 5.0)
- Analytical Data Quality Assurance Plan (Section 6.0)
- Construction quality assurance (Section 7.0)
- References (Section 8.0)

1.2 RELATIONSHIP TO OTHER INVESTIGATIONS AND ACTIONS

This basis of design and site management plan was prepared concurrently with completion of the facility-wide Remedial Investigation (RI), and initiation of the Feasibility Study (FS) Workplan. Supplemental RI, including field work, of the trichloroethene (TCE) plume in groundwater beneath Powder Mill Gulch and surface water in Powder Mill Creek was also being conducted during preparation of this document. Two IA's related to the TCE plume are also being proposed by Boeing, the plans for which will be appended to the forthcoming AO modification.

1.3 PROJECT OBJECTIVE AND SCOPE

1.3.1 Objective

The overall purpose of this IA is to remove sediment in PMC containing relatively higher concentrations of PCBs (as compared to concentrations in other downstream reaches of the creek), in order to minimize the potential future distribution of these PCBs further downstream through bedload and suspended load transport prior to completion of the FS and Cleanup Action Plan (CAP) and implementation of a final remedy. This purpose is commensurate with the purpose of an IA as defined in WAC 173-340-430(1)(b), "A remedial action that corrects a problem that may become substantially worse or cost substantially more to address if the remedial action is delayed." Additional information regarding the creek in the area of the proposed IA, prior RI results, and the likely source of PCBs is presented in Section 2.0.

This IA is intended to provide a partial cleanup, removing sediment with the highest concentrations of PCBs, in accordance with WAC 173-340-430(2)(b). Because the cleanup level for PCBs in PMC has not yet been established, it is possible that this IA will ultimately constitute the final cleanup action (see WAC 173-340-430[4][b] regarding interim actions as the final action). If not, this IA is consistent with the likely future cleanup action – physical removal of sediment containing PCBs. Conducting this interim action does not foreclose any reasonable alternatives for future cleanup action. This interim action is therefore consistent with the requirements of WAC 173-340-430(3).

Based on the overall purpose of this interim action, and because the cleanup levels for PCBs in sediment have not been established, the cleanup action objective (CAO) for this interim action is established as a physical removal goal, rather than a PCB concentration target.

The CAO for this interim action is to:

Physically remove sediment within the reach of PMC from the base of the detention basin spillway to 120 feet downstream of the spillway (approximately sampling location PMG-3D), to the extent specified in the design, and restore the creek flow conditions and habitat. For the purposes of decision making during construction, the PCB concentrations in the confirmation samples will be compared to the pre-design sample data to evaluate whether a sufficient mass of PCBs has been removed. The expectation is that the specified depth of sediment removal (12 inches) will leave behind PCB concentrations at the same order of magnitude as those concentrations found in 12 inch to 24 inch samples during pre-design sampling. Therefore, confirmation sample results for PCBs in the concentration range of "not detected" to approximately 100 µg/kg will be interpreted to mean that a sufficient mass has been removed. However, because this is a qualitative comparison standard, one or a few results exceeding 100 µg/kg will not necessarily result in additional sediment removal. The actual data will be compared to the pre-design data by Boeing and Ecology and a real-time agreement will be reached as to whether additional sediment removal is warranted.

1.3.2 Scope

The scope of the interim action includes:

- Preparation of the design package
- Procurement of the construction contractor
- Construction management
- Permitting and agency liaison
- Mobilization and preparation of access and staging areas
- Removal of sediment from Powder Mill Creek to meet the CAO
- Handling, characterization, and disposal of removed sediment
- Confirmation sampling within the excavated creek bed
- Reconstruction of the creek bed and habitat
- Replanting of vegetation within the work area
- Restoration of access and staging
- Demobilization
- Initial maintenance

1.4 SUMMARY OF INTERIM ACTION

This subsection provides a brief narrative summary of the planned interim action. Details and supporting information are provided throughout the remainder of this document.

Streambed sediment containing PCBs within the headwaters reach of PMC will be removed to reduce the potential for mobilization and downstream transport of PCBs. Sediment removal will be performed in the first 120 feet of creek downstream of the stormwater detention basin stilling basin (Figure 2), over the entire width of the creek bed, to a nominal depth of 12 inches. The removal dimensions are based on analytical results of sediment samples indicating that a substantial percentage of the PCB mass in creek sediments is present within these dimensions (Figure 3), see Section 3.2.3.

Sediment to be removed is present in the project reach as loose sand and gravel and as infill between large riprap boulders. Sediment removal will be performed by a qualified contractor using excavation equipment, vacuum truck extraction, pressure washing, and hand excavation, as needed. One access point for heavy equipment will be created on the western bank at the head of the creek. All sediment will be moved to that access point by in-creek equipment and then transported from the creek directly into roll-off containers located at the creek bank. This will also serve as the access point for post-excavation restoration of the creek bed.

The sediment will be allowed to free drain within the creek to the extent possible prior to transport out of the creek, to minimize the possibility for contaminant distribution outside of the creek. Additional sediment dewatering will occur in the roll-off containers, which will be lined and equipped with drainage nets. As a roll-off container is filled it will be transported to a temporary storage area, which will be equipped with secondary containment. If a vacuum truck is used to

transport sediment out of the creek, the contents of the vacuum truck will be transferred to roll-off containers within the secondary containment of the temporary storage area.

Once the sediment has fully dewatered, Boeing will dispose of the water and sediment in the roll-off containers using the on-site treatment processes being used to dispose of PCB waste materials and water associated with Boeings recently completed Flightline joint sealant compound replacement project. Boeing has an active program at the Everett facility for handling and disposing of both water and solids containing PCBs (including a vacuum truck dedicated to handling water containing PCBs). This design makes use of this program by requiring the contractor to stage the sediment in roll-off units equipped with drainage nets, within an area of secondary containment. The existing Boeing program for water and solids handling will then be used to properly dispose of the material. Water from the roll-offs will be transported by vacuum truck to the Flightline water treatment system at Stall 205.5 for treatment and discharge to the Everett POTW. The dewatered material in the roll-offs will then be shipped to Arlington, Oregon for disposal.

The contractor will return to the site to remove the secondary containment upon removal of the waste materials and containers by Boeing.

Water within the project reach will be collected in a shallow sump dug at the downstream end of the work area. Water may include wash water used to dislodge sediment, seepage from the draining sediments being removed, and groundwater that enters the excavation. The water will be collected, treated to below the City of Everett discharge requirement of 3 µg/L PCBs, tested, and discharged to the City of Everett sanitary sewer at a manhole located in the project area. The sanitary sewer discharges to a publicly owned treatment works (POTW). Any batch of water that does not meet the discharge requirements will be retreated prior to discharge.

Sediment samples will be collected from the bed of the creek following sediment removal and analyzed for PCBs to document that the sediment removal meets the project objectives. After approval of the results of this sampling, the creek will be restored with habitat-appropriate materials (e.g., fish-mix gravel, woody debris) and structures designed to optimize stream hydraulics in this reach. Anchoring of some restoration features will require some additional excavation at certain locations in the project reach. Excavated material will be handled as though it were contaminated – it will be stored and dewatered in roll-off containers and then shipped off site for disposal.

During construction, PMC downstream of the work area and nearby surface water bodies will be protected using construction best management practices (BMPs) for stormwater management. New cut slopes required to construct the creek access will be covered with a rolled erosion control product and seeded when grading is complete. These slopes will be planted with trees and shrubs during a later, weather-appropriate season. PMC downstream of the work area will be isolated from the work area. PMC in the work area and immediately downstream is not expected to be flowing at the time of the work. A contingency plan will be in place in the event of an unexpected storm that results in surface water flow within the project reach.

1.5 ORGANIZATION AND RESPONSIBILITY

The project team will consist of personnel from Boeing, URS Corporation (URS) and their subcontractors, and Boeing's contract laboratory Analytical Resources Inc. (ARI) as shown in the table below. The construction subcontractor will be selected after finalization of the design package and contact information will be added when available. The following paragraphs describe the major positions and responsibilities of the team for design and construction, along with the approach to data quality assurance management. Construction quality assurance is discussed in Section 7.0. Key project personnel and regulatory personnel and their responsibilities for QA activities are described below.

1.5.1 Project Coordinator

The Boeing Project Coordinator, Nick Garson of The Boeing Company will be responsible for overseeing the implementation of the Agreed Order and this interim action at the Everett Plant. He will be assisted by the Everett Plant project representative, Alan Sugino, and one or more Boeing field coordinators. In addition, Dean Yasuda will be Ecology's project coordinator. To the maximum extent possible, all communications between Ecology and Boeing and all documents should be directed through the Project Coordinators. These documents include but are not limited to reports, work plans, designs, and other correspondence concerning the activities performed pursuant to the order. If Ecology or Boeing changes Project Coordinators, written notification will be provided to Ecology or Boeing at least 10 calendar days prior to the change.

1.5.2 Project Manager

The URS Project Manager, Mark Molinari, will be responsible for management and implementation of all aspects of the design and construction. Specific responsibilities include review and approval of work products, ensuring that appropriate design and construction procedures are followed, reporting of deviations from the Ecology-approved work plans and design to the Boeing and Ecology Project Coordinators, and ensuring that the data collected will satisfy the data quality objectives.

1.5.3 Analytical Data QA/QC Manager

The URS Analytical Data QA/QC Manager, Karen Mixon, is responsible for developing and managing procedures described in the QAPP, interfacing with the project laboratory and data quality assessment personnel, reviewing QA/QC audit reports, coordinating audit procedures, implementing necessary corrective action procedures, reviewing and evaluating analytical laboratory results, reviewing data quality assessment reports, and reporting to the URS Project Manager.

1.5.4 Interim Action Task Manager

The URS IA Task Manager, Michael Meyer, is responsible for coordinating day-to-day activities associated with the IA, including data management and evaluation, design, and construction. The

IA Task Manager coordinates the design and construction management staff, interacts with the Project Engineer to help ensure conformance to scope, schedule, and budget, interacts with the Analytical Data QA/QC Manager to help ensure data and work product quality, and reports to the Project Manager.

1.5.5 Project Engineer

The project engineer is a professional engineer registered in the State of Washington responsible for the design and for observing and reviewing the construction for conformance to the design. The Project Engineer directs the design and construction management staff, interacts with the IA Task Manager, and reports to the Project Manager. The Project Engineer seals the final design package.

1.5.6 Design Staff

The design staff include engineers and scientists from a variety of disciplines, including civil engineering, hydraulic engineering, geotechnical engineering, biology, engineering geology, and hydrogeology. The design staff works as a team, under the direction of the IA Task Manager, to evaluate the pre-design data and historic data and to prepare a comprehensive design for sediment removal, waste management, and creek restoration. The design staff are then available as needed to answer questions regarding the design during construction.

1.5.7 Construction Management Staff

The construction management staff represent the owner and are responsible for supervising the day-to-day performance of construction quality assurance (see Section 7.0). The construction management staff will be responsible for observing and documenting activities associated with quality assurance for materials, equipment, and installation during the IA construction activities. The construction management staff will also be responsible for implementing the sediment sampling and handling procedures as specified in design for excavated sediment characterization and confirmation. They will ensure that field procedures follow the appropriate work plan, notify the Project Manager, IA Task Manager, or QA/QC Manager, as appropriate, of difficulties encountered during the field program, and implement corrective actions to the field procedures as approved by the Project Manager.

1.5.8 Analytical Laboratory Project Manager

The ARI analytical laboratory project manager, Stephanie Lucas, is responsible for reviewing and reporting all analytical data generated during the project, responding to questions or concerns regarding the quality of the data that the URS Project Manager, QA/QC manager, or data quality assessment personnel may have, and implementing any corrective actions deemed necessary by these individuals with regards to laboratory operations.

1.5.9 Construction Contractor Superintendent

The construction contractor for the IA is yet to be decided. The selected firm will be subcontracted to URS and the contractor's job superintendent will be responsible for implementing the design and performing construction quality control (see Section 7.0).

Project Contacts

Key Role	Name	Phone Numbers	Email Address	Mailing Address
The Boeing Company				
Project Coordinator	Nick Garson, P.G.	(425) 269-7866 (cellular)	nick.garson@boeing.com	Shared Services Group (SSG) Environmental Remediation PO Box 3707, MC 1W-12 Seattle, WA 98124-2207
Everett Plant Project Representative	Alan Sugino	(425) 266-8173 (Office phone) (206) 797-2052 (Pager)	alan.k.sugino@boeing.com	BCA Everett Environmental Affairs PO Box 3707, MC OP-88 Seattle, WA 98124-2207
Washington State Department of Ecology				
Project Coordinator	Dean Yasuda, P.E.	(425) 649-7264	dyas461@ecy.wa.gov	Department of Ecology-Northwest Regional Office 3190 160th Avenue S.E. Bellevue, Washington 98008-5452
Sediment Specialist	Brad Helland, P.E.	(425) 649-7138	BHEL461@ecy.wa.gov	
URS Corporation				
Project Manager	Mark Molinari	(206) 438-2700 (Switchboard) (206) 438-2235 (Direct Line) (206) 619-5946 (Cellular)	mark_molinari@urscorp.com	URS Corporation 1501 4th Avenue, Suite 1400 Seattle, WA 98101
QA/QC Manager	Karen Mixon	(206) 438-2234 (Direct Line)	karen_mixon@urscorp.com	
IA Task Manager	Michael Meyer	(206) 438-2226 (Direct Line) (206) 849-7062 (Cellular)	michael_meyer@urscorp.com	
Project Engineers	Selene Fisher Dan Hawk	(206) 438-2419 (Direct Line) (206) 438-2144 (Direct Line)	selene_fisher@urscorp.com daniel_hawk@urscorp.com	
Analytical Resources, Inc.				
Project Manager	Stephanie Lucas	(206) 695-6200 (206) 695-6213 (Direct Line)	steph@arilabs.com	Analytical Resources, Inc. 4611 South 134th Place, Suite 100 Tukwila, WA 98168

Note:
IA - Interim Action

2.0 SITE DESCRIPTION AND BACKGROUND

2.1 EVERETT PLANT

The Agreed Order identifies the BCA Everett Plant as the contiguous property located at 3003 West Casino Road. The BCA Everett Plant is legally described as the property located in the south half of Section 10 and the north half of Section 15, Township 28 North, Range 4 East, Willamette Meridian, in Snohomish County, Washington. The Everett Plant consists of the North Complex, located north of Highway 526, and the South Complex and BOMARC Business Park located on the south side of Highway 526 (Figure 1). The North Complex is bounded on the south by Highway 526 and to the east by Seaway Boulevard. Japanese Gulch and Powder Mill Gulch (PMG) lie to the west and north, respectively, of the North Complex. Highway 526 bounds the South Complex at its northern edge, with Airport Road to the east and Paine Field to the west and south. The BOMARC Business Park is located southeast of the South Complex and accessed via Airport Road.

The BCA Everett Plant is the main manufacturing and assembly complex for Boeing's 747, 767, and 777 jetliners. Construction of the Everett Plant began in 1966 for assembly of the 747. The plant was expanded in 1980 to accommodate 767 production and again in 1992 to accommodate 777 production. The plant currently occupies approximately 1,000 acres. The BCA Everett Plant is owned, operated, and under the control of The Boeing Company, except for the BOMARC area that is on land leased from Snohomish County. The current and foreseeable future use of the property will be for commercial aircraft manufacturing operations.

2.2 POWDER MILL GULCH

Upper PMG is located on the north side of the Everett Plant (Figure 2). This gulch is incised into the upland (Figure 2) and extends downward into the Esperance Sand aquifer. The Esperance Sand aquifer is a regional aquifer and underlies the entire Everett Plant. PMG formerly extended to the south-southeast from its current extent, but the upper reaches were filled for construction of the plant. Currently, the head of the gulch is occupied by the facility's stormwater detention and sedimentation basins and associated peat filter system and created wetlands.

The detention and sedimentation basins are asphalt-lined. The detention basin was constructed during the original plant construction in 1968-69. In 1991-92 the detention basin was modified, and the sedimentation basin, peat filter system, and created wetlands were constructed. Stormwater is primarily routed to the sedimentation basin then through the peat filter system. The peat filter system discharges to the created wetlands which then discharge to PMC. The sedimentation basin receives up to 100 cubic feet per second (cfs); however discharge to the peat filter system is limited to 8 cfs. Flow in excess of 100 cfs is routed to the detention basin (bypassing the sedimentation basin) and is discharged directly to the head of the creek (Figure 2) through a discharge pipe at the base of the spillway. Maximum flow through the discharge pipe to the head of PMC is 49 cfs. The detention basin spillway is designed for overflow conditions,

which, to the knowledge of plant personnel, have never occurred since the basin was modified. (A. Sugino, personal communication 2005)

The uppermost several hundred feet of the creek has intermittent flow; whereas perennial flow occurs downstream from springs in the creek floor beginning approximately 200 feet downstream from the detention basin outfall. The creek exits Boeing property via a culvert beneath Seaway Boulevard (Figure 2) and extends through City of Everett and private property for approximately 1 ½ miles prior to discharging into Port Gardner Bay.

2.3 BACKGROUND

The Boeing Company notified the US Environmental Protection Agency (EPA), Region 10, of its dangerous waste management activities at the BCA Everett Plant on August 6, 1980, including the storage of dangerous wastes under RCRA interim status requirements (Section 3005) and implementing regulations such as the authorized Washington State Dangerous Waste Regulations (WAC 173-303). Boeing submitted Part A of its RCRA dangerous waste storage permit application to EPA on November 17, 1980, and its Part B application on November 7, 1988.

EPA subcontractors performed a RCRA Facility Assessment of the BCA Everett Plant, which recommended subsurface soil and groundwater investigations of specific SWMUs and AOCs, and Ecology identified additional SWMUs/AOCs requiring further assessment. Releases and potential releases from these SWMUs/AOCs, identified in the February 12, 1997 Agreed Order (Attachments 5 through 8), were addressed in the RI Work Plan and Interim Action Work Plan (Dames and Moore, 1997a,b). Site conditions at each SWMU/AOC were subsequently evaluated in two RI Reports (URS, 2001, 2002). These reports are currently being revised to incorporate new data, primarily from supplemental investigations in PMG.

The RI report for sediment and surface water (URS 2001) identified PCBs as a contaminant of potential concern (COPC) in sediment in Powder Mill Creek. The source of PCBs in this area was identified as the Flightline joint compound and a joint replacement program was initiated in the summer of 2001 per TSCA regulations and under the oversight of EPA. The joint replacement program was completed in the fall of 2005.

Particles of weathered Flightline joint compound containing PCBs were being carried into the stormwater system during rainfall events and transported to the stormwater structures at the head of PMC. Prior to 1991, the stormwater was discharged to the detention basin prior to discharge to PMC. Since 1991, most of the stormwater was directed to the sedimentation basin and subsequently filtered through the peat filter, where the PCBs were likely to have been largely removed. The filtered stormwater is then discharged to the created wetland. Excess stormwater flows were diverted to the detention basin and discharged to PMC without filtration. This is a typical operation for a stormwater system (low and moderate flows and "first flush" water is treated, whereas higher flows that are presumably less contaminated are bypassed). The water level in the detention basin is maintained at 8 feet through the use of a riser-pipe discharge system (the "outlet riser"). Boeing voluntarily initiated modifications to the detention basin (including the

outlet riser) during February 2003. The modification of the detention basin outlet riser was included in the 2004 agreed order modification, to further reduce the amount of PCBs released to PMC from the detention basin. Maintenance of an 8-foot water depth in the detention basin results in the increased settling of solids prior to discharge through the riser pipe.

Stormwater structures (catch basins, oil/water separators, trenches) in the area impacted by PCB-containing joint sealant are cleaned annually in accordance with an agreement with the EPA Region 10. Also, following completion of the joint compound replacement, the stormwater structures (catch basins, oil/water separators, trenches, and pipes) will be cleaned to remove remaining solids potentially containing PCBs in accordance with a work plan that was required by the second Agreed Order amendment. Because the creek is downstream of the Flightline and stormwater structures, PCB-contaminated solids entrained in the stormwater system might recontaminate the creek.

3.0 BASIS OF DESIGN

3.1 APPLICABLE AND RELEVANT AND APPROPRIATE REGULATIONS

MTCA, under WAC 173-340-710, requires that interim actions comply with legally applicable state and federal laws and regulations, and those requirements determined to be relevant and appropriate (hereinafter "ARARs"). This section discusses the ARARs for the sediment removal IA in PMC. The ARARs in this section are repeated from the draft IAWP (URS 2005c), with updates regarding how each ARAR is met by the design. The definition of ARARs and associated concepts are discussed below.

"Applicable" requirements under MTCA are those cleanup standards, standards of control, and other human health and environmental protection requirements, criteria, or limitations adopted under state or federal law that specifically address a hazardous substance, cleanup action, location, or other circumstance at a site (WAC 173-340-200).

"Relevant and appropriate" requirements include those cleanup standards, standards of control, and other human health and environmental requirements, criteria, or limitations established under state or federal law that, while not legally applicable to the hazardous substance, cleanup action, location, or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the particular site (WAC 173-340-200). WAC 173-340-710(3) identifies the criteria to be used in determining whether a requirement is relevant and appropriate which include:

- Whether the purpose underlying the requirement is similar to the purpose of the cleanup action
- Whether the media regulated or affected by the requirement is similar to the media contaminated or affected at the site
- Whether the hazardous substance regulated by the requirement is similar to the hazardous substance found at the site
- Whether the entities or interests affected or protected by the requirement are similar to the entities or interests affected by the site
- Whether the actions or activities regulated by the requirement are similar to the cleanup action contemplated at the site
- Whether any variance, waiver, or exemption to the requirements are available for the circumstances of the site
- Whether the type of place regulated is similar to the site

- Whether the type and size of structure or site regulated is similar to the type and size of structure or site affected by the release or contemplated by the cleanup action
- Whether any consideration of use or potential use of affected resources in the requirement is similar to the use or potential use of the resources affected by the site or contemplated cleanup action.

In accordance with WAC 173-340-710(9)(b), IAs conducted under an agreed order are exempt from the procedural requirements of certain state and local laws, including the Washington State Clean Air Act (Chapter 70.94 RCW), Washington State Solid Waste Management Act (Chapter 70.95 RCW), Washington State Hazardous Waste Management Act (Chapter 70.105 RCW), Washington State Construction Projects in Water Act (Chapter 75.20 RCW, recodified at Chapter 77.55 RCW), Washington State Water Pollution Control (Chapter 90.48 RCW) and Washington State Shoreline Management Act (Chapter 90.58 RCW), as well as any laws requiring or authorizing local government permits or approvals for the action. The IA must still comply with the substantive requirements of the laws in accordance with WAC 173-340-710(9)(c). It is part of Ecology's role under an agreed order to ensure compliance with the substantive requirements, and to provide an opportunity for comment by the public, state agencies, and local governments (WAC 173-340-170[9][d]). In addition, the IA is not exempt from fully complying with federal regulations and obtaining permits from federal agencies, such as a Clean Water Act section 404 permit.

3.1.1 Chemical-Specific ARARs

Chemical-specific ARARs generally set risk-based concentration limits for specific chemicals within environmental media. The chemical-specific ARAR values may identify an acceptable amount or concentration of a hazardous substance that may be found in or discharged to the environment.

This interim action is focused on PCBs in sediment in PMC. No federal or state statutes or regulations establish numerical standards for PCBs in freshwater sediment. Cleanup levels for the final corrective action will be established through a cooperative effort between Ecology and Boeing during the FS and CAP process, subsequent to performance of this IA. The cleanup level for PCBs in the freshwater sediment of PMC will be formally established in the CAP. The goals of this IA are not based on meeting a PCB concentration in sediment, but rather physical removal of impacted sediment within a defined area of the creek channel. The corrective action objective for this IA is:

> Physically remove sediment within the reach of PMC from the base of the detention basin spillway to 120 feet downstream of the spillway (approximately sampling location PMG-3D), to the extent specified in the design, and restore the creek flow conditions and habitat.

The IA will be conducted in a reach of PMC that receives only intermittent flows of stormwater. The design for this IA specifies conducting work during the dry season when stormwater is not expected and the work area reach will be relatively dry. An emergency procedure is included in the design to address the potential for an unexpected storm. Any groundwater encountered during excavation will be collected, managed, and disposed of outside of the stream work area. Potential ARARs for this activity are presented in Section 3.1.3. Based upon the proposed approach, no chemical-specific ARARs are identified for this IA.

3.1.2 Location-Specific ARARs

Location-specific ARARs are those requirements that relate to the geographical position or physical condition of the site or its immediate environment. These requirements may limit the type of remedial action that can be implemented, or may impose additional constraints on some remedial alternatives. Location-specific ARARs that could affect remedial actions at the site are briefly described below, along with the manner in which the design meets each ARAR.

Special Status Species

Endangered Species Act (ESA) 16 USC 1531-1543, 50 CFR Parts 17 and 402. The ESA would be potentially applicable to the interim action in PMC if threatened or endangered species were present in the work area. The electrofishing survey conducted as part of the pre-design investigation showed that no fish are present in the reach of PMC selected for this IA (Section 3.4.4). Site reconnaissance and research indicated that no endangered species are present in the work area (Section 3.4.4). The ESA consultation with USFWS and NOAA Fisheries was performed by the USACE during the notification process under the Clean Water Act (CWA) Section 404 Nationwide Permit (NWP) process. As a result of this process USACE determined that the project will have No Effects on threatened or endangered species.

Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), 16 USC 1801 et. seq., 50 CFR Part 600. The MSFCMA and its implementing regulations were adopted to conserve and manage the fishery resources found off the coasts of the United States, and the anadromous species and Continental Shelf fishery resources of the United States in part by protecting essential fish habitat (EFH) during review of projects where Federal permits, licenses, or other authorities that affect or have the potential to affect such habitat. EFH was not identified in the reach of PMC selected for this IA during the ESA consultation process through USACE, and therefore this ARAR is not applicable to the IA.

Fish and Wildlife Conservation Act, 16 USC 2901; 50 CFR 83. The FWCA requires federal agencies to use their authority to conserve and promote conservation of non-game fish and wildlife. Non-game fish and wildlife are defined as fish and wildlife that are not taken for food or sport, that are not endangered or threatened and that are not domesticated. This requirement is not applicable to the site because no fish are present in the reach of PMC selected for this IA.

Sensitive Environments

Clean Water Act, Section 404—Dredge or Fill Requirements Regulations, 33 USC 1344(a) – (d); 33 CFR Parts 320-330; 40 CFR Part 230. These requirements are applicable to remedial actions in or near navigable waters, which include wetlands, and establish requirements that limit the discharge of dredged or fill material to these waters. EPA guidelines for discharge of dredged or fill materials in 40 CFR Part 230 specify consideration of alternatives that have less adverse impacts; prohibit discharges that would result in exceedance of surface water quality standards, exceedance of toxic effluent standards, and jeopardy of threatened or endangered species; and provide for evaluation and testing of fill materials before placement.

This ARAR is met for this IA by coverage under a USACE CWA Section 404 Nationwide Permit No. 38, issued for this action by USACE on February 8, 2006. The specific requirements under this permit are included in Appendix A. These requirements are met by the design.

Clean Water Act, Section 401, Water Quality Certification, 33 USC 1340; WAC 173-225-010. Section 401 of the Federal Water Pollution Control Act (FWPCA) provides that applicants for a license or permit from the federal government relating to any activity which may result in any discharge into the navigable waters shall obtain a certification from the state that the water quality standards will be met. Under MTCA only substantive compliance with this Washington State Water Pollution Control Act requirement (WSWPCA) is required. Ecology's Water Quality Section has reviewed the NWP No. 38 issued by the USACE. Ecology will also review the draft and final design to ensure compliance with WSWPCA requirements.

Washington Hydraulics Project Approval (RCW 75.20.100; Chapter 220-110 WAC). This regulation requires WDFW approval for projects that will use, divert, obstruct, or change the natural flow or bed of waters of the state, such as PMC. WDFW typically issues in-stream work windows under the authority of this program. Under MTCA only substantive compliance with this Washington State Construction Projects in Water Act requirement is required.

WDFW provided a written summary of the expected requirements for this IA in a letter dated December 7, 2005 (included in Appendix A). WDFW required that the technical provisions from WAC 220-110 be followed to protect fish life, and cited specific subsections –120, -130, and –080. WDFW also included several project-specific requirements. The WDFW requirements are reproduced in this subsection (shown in italic type), along with a discussion of how the design meets each requirement.

WAC 220-110-120 Temporary Bypass Culvert, Flume, or Channel.

> *Temporary bypass culvert, flume, or channel projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat. The following technical provisions shall apply to temporary bypass culvert, flume, or channel projects:*

The reach of creek selected for this IA is not utilized by fish and protection of productive capacity is therefore not necessary.

(1) *The temporary bypass culvert, flume, or channel shall be in place prior to initiation of other work in the wetted perimeter.*

During the season selected for the work, there is essentially no flow from the upstream end of the project reach. Seepage water will be collected in a sump within the work area.

(2) A sandbag revetment or similar device shall be installed at the inlet to divert the entire flow through the culvert, flume, or channel.

During the season selected for the work, there is essentially no flow from the upstream end of the project reach. Seepage water will be collected in a sump within the work area.

(3) A sandbag revetment or similar device shall be installed at the downstream end of the culvert, flume, or channel to prevent backwater from entering the work area.

No flow is expected within, through, or immediately downstream of the project reach during the season selected for the work. The design requires placement of a sand bag decant weir at the downstream end of the work area, to temporarily impound and provide settlement for any unexpected flow.

(4) The culvert, flume, or channel shall be of sufficient size to pass flows and debris for the duration of the project.

During the season selected for the work, there is essentially no flow from the upstream end of the project reach. Seepage water will be collected in a sump within the work area.

(6) Prior to releasing the water flow to the project area, all bank protection or armoring shall be completed.

The design requires restoration of the stream banks and placement of interim protection prior to the first storm flows.

(7) Upon completion of the project, all material used in the temporary bypass shall be removed from the site and the site returned to preproject conditions.

Site restoration is included as a requirement of the design.

(8) If fish may be adversely impacted as a result of this project, the permittee shall be required to capture and safely move game and food fish and other fish life, (at the discretion of the department), from the job site to the nearest

free-flowing water. The permittee may request the department to assist in capturing and safely moving fish life from the job site to free-flowing water, and assistance may be granted if personnel are available.

No fish are present within the project reach.

(9) *Alteration or disturbance of the banks and bank vegetation shall be limited to that necessary to construct the project. All disturbed areas shall be protected from erosion, within seven days of completion of the project, using vegetation or other means. The banks shall be revegetated within one year with native or other approved woody species. Vegetative cuttings shall be planted at a maximum interval of three feet (on center), and maintained as necessary for three years to ensure eighty percent survival. Where proposed, planting densities and maintenance requirements for rooted stock will be determined on a site-specific basis. The requirement to plant woody vegetation may be waived for areas where the potential for natural revegetation is adequate, or where other engineering or safety factors preclude them.*

Replanting required in the design meets this requirement.

WAC 220-110-130 Dredging In Freshwater Areas.

Dredging projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat. The following technical provisions shall apply to dredging projects:

(1) *Dredging shall not be conducted in fish spawning areas unless it is designed to create or improve the access or quality of fish spawning areas.*

The project reach is not utilized by fish. The project will improve sediment quality.

(4) *Dredging shall be conducted with dredge types and methods that cause the least adverse impact to fish and shellfish and their habitat.*

The project reach is not utilized by fish.

(8) *Upon completion of the dredging, the bed shall not contain pits, potholes, or large depressions to avoid stranding of fish.*

The project reach is not utilized by fish. Nevertheless, the design meets this standard.

WAC 220-110-080 Channel Change/Realignment.

Channel changes/realignments are generally discouraged, and shall only be approved where the applicant can demonstrate benefits or lack of adverse impact to fish life. Channel change/realignment projects shall incorporate mitigation measures as necessary

to achieve no-net-loss of productive capacity of fish and shellfish habitat. The following technical provisions shall apply to channel change and channel realignment projects:

(1) Permanent new channels shall, at a minimum, be similar in length, width, depth, floodplain configuration, and gradient, as the old channel. The new channel shall incorporate fish habitat components, bed materials, meander configuration, and native or other approved vegetation equivalent to or greater than that which previously existed in the old channel.

(a) Approved fish habitat components, bed materials and bank protection to prevent erosion shall be in place.

(b) Approved fish habitat components shall be installed according to an approved design to withstand the 100-year peak flows.

The project reach is not utilized by fish. Nevertheless, the design meets this standard.

(5) All disturbed areas shall be protected from erosion, within seven days of completion of the project, using vegetation or other means. The banks shall be revegetated within one year with native or other approved woody species. Vegetative cuttings shall be planted at a maximum interval of three feet (on center), and maintained as necessary for three years to ensure eighty percent survival. Where proposed, planting densities and maintenance requirements for rooted stock will be determined on a site-specific basis. The requirement to plant woody vegetation may be waived for areas where the potential for natural revegetation is adequate, or where other engineering or safety factors preclude them.

Replanting required in the design meets this requirement.

NOTIFICATION REQUIREMENT: The Area Habitat Biologist listed below shall be contacted by phone or e-mail (holsegh@dfw.wa.gov) within seven days of completion of work to arrange for a compliance inspection.

This requirement is written in to the Site Management Plan (Section 4.10).

The dredging shall be conducted in the dry or isolation from the stream flow by the installation of a bypass flume or culvert, or by pumping the stream flow around the work area. Care shall be taken so that the stream below the project area is never dewatered. At least half the flow of the stream shall be maintained in the downstream reach at all times.

No flow is expected within, through, or immediately downstream of the project reach during the season selected for the work. A small amount of water will be collected during construction, primarily from seepage out of the sediment being removed. Removal of this water is not expected to measurably decrease downstream instream flow.

Following the dredging of the stream, appropriate fish-mix gravel must be used to line the exposed bottom of the stream channel.

This requirement is met by the stream restoration design.

Woody debris shall be placed in a manner which causes the least amount of disturbance to the streambed.

This requirement is met by the stream restoration design.

Woody debris may be placed by hand or by equipment stationed on the bank. All soils disturbed and exposed by equipment shall be given a temporary erosion control treatment (seeding, mulching, etc.) as needed prior to other plantings in the buffer.

This requirement is met by the stream restoration design.

The woody debris shall be of fir, cedar, or other approved coniferous species.

This requirement is met by the stream restoration design.

At least half of the large woody debris shall be placed so it is within the low flow channel.

This requirement is met by the stream restoration design.

If excessive clouding of the water occurs upon reintroduction of the stream flow to the dredged area, the stream flow must be reintroduced in stages. Once the dredged area has filled with water, the stream flow must again be diverted around the work area in order to allow sediments to settle. Once settling has occurred, the stream flow may be returned to its original course.

The design requires that the sandbag decant weir be left in place until the first flush of stormwater has passed through the project reach, to allow sediments to settle before opening the stream to normal flow.

Establishment of an in-stream work window is not necessary for this IA because no fish are present in the reach selected for action. However, the dry-season time frame chosen for the work corresponds roughly to typical in-stream work windows established for other water bodies.

Native American Concerns and Cultural Resources Protection

Native American Graves Protection and Repatriation Act (NAGPRA) Regulations, 25 USC 3001 et. seq; 43 CFR Part 10.1, 10.4 and 10.5. This act protects Native American burial sites and funerary objects. If Native American graves are discovered within the area where the remedial activity occurs, the US Department of Interior and the Indian tribe with ownership must be notified of the inadvertent discovery and the activity must cease until a reasonable effort is taken to protect the discovered items. NAGPRA regulations are unlikely to be applicable to this IA because the

work area has been previously disturbed during construction of the existing stormwater structures. If Native American materials are inadvertently discovered during excavation, the excavation will cease and the affiliated tribes will be notified and consulted. This language is written into the design specifications.

National Historic Preservation Act (NHPA), 16 USC 470; 36 CFR Parts 60, 65, and 800. The National Historic Preservation Act (NHPA) requires federal agencies to assess the impact of proposed actions on historic or culturally important sites, structures, or objects within the site of the proposed projects. It further requires federal agencies to assess all sites, buildings, and objects on the site to determine if any qualify for inclusion in the National Register of Historic Places (NRHP) or as a National Historic Landmark. Historic sites and structures are unlikely to be present at the site because the work area has been previously disturbed during construction of the existing stormwater structures. However, should ground-disturbing activities such as sediment removal uncover sites, unavoidable impacts on historic sites or structures will be mitigated, in consultation with the State Historic Preservation Officer (SHPO), through such means as taking photographs and collecting historical records. Language regarding historic sites and structures has been written in to the design specifications.

Archaeological and Historic Preservation Act (AHPA), 16 USC 469. This act establishes procedures to provide for the preservation of historical and archaeological data that might be destroyed through alteration of terrain as a result of a federally licensed activity or program. If historic or archaeological artifacts are present in the area where the remedial activity will occur, the remedial activity must be designed to minimize adverse effects on the artifacts. No historic or archaeological data are likely to be present in the IA work area because the area was previously disturbed during construction of the existing stormwater structures. However, should ground-disturbing activities such as sediment removal uncover sites, unavoidable impacts on artifacts could be mitigated, in consultation with the SHPO, through such means as taking photographs and collecting historical records. Language regarding historic and archaeological data has been written in to the design specifications.

Local Requirements

The Boeing property and PMC are located within the city limits of the City of Everett. Consequently, City of Everett ordinances are potentially applicable to the interim action. The City of Everett reviewed the draft IAWP and found that the conceptual approach was in substantive compliance with the City's requirements. The City will also review the draft and final design to ensure compliance with these requirements.

Snohomish County Shoreline Management Program, RCW 90.58; WAC 173-27-060, Chapter 30.44 Snohomish County Code and Critical Areas Ordinance (CAO), Chapter 30.62 SCC. Snohomish County regulations were included as potential ARARs in the draft IAWP. The project site is within the city limits of the City of Everett, however, and therefore Snohomish County regulations are superseded by City regulations.

Environmentally Sensitive Areas Regulations, Title 19.37 Everett Municipal Code (EMC), Chapter 36.70A RCW. Development in critical areas is regulated under the Washington State Growth Management Act (Chapter 36.70A RCW), as implemented through ordinances developed by local jurisdictions. In 1995 the Growth Management Act was amended to require counties and cities to include the best available science in developing policies and development regulations to protect the functions and values of critical areas. All counties and cities in the state are required to review, evaluate, and, if necessary, revise their critical areas ordinances according to a schedule established by the state Legislature and approved by the Governor.

The City of Everett's critical areas ordinances are found at Title 19.37 EMC. Critical areas include wetlands and streams. Any alternation or development in wetlands or streams must be evaluated by the City for potential impacts. The EMC provisions require the submittal of "studies which describe the environmental conditions of the site" submitted by qualified experts [Title 37.070(B) EMC]. The City's practice is to require an environmental checklist under the State Environmental Policy Act (SEPA, Chapter 43.21C RCW) for proposed development in critical areas. Information in the checklist is used to evaluate the potential effects of the proposed action. A mitigation plan is required in cases of permanent alteration of critical areas. Required mitigation is determined individually for each project. The provisions most likely to guide development of mitigation measures are EMC 37.110, Avoiding Wetland Impacts, and EMC 37.150(A), Avoiding Stream Impacts, both of which establish a goal of no net loss of functional values. To meet the requirements of the critical areas ordinance, the City of Everett was provided a draft SEPA checklist for the project, along with the IAWP. The City verbally indicated that the conceptual design in the IAWP appeared to meet relevant City requirements. The City will also review the draft and final designs.

Washington State Shoreline Management Act and City of Everett Shoreline Management Program, RCW 90.58; WAC 173-27-060, Title 19.30A EMC. The Shoreline Management Act is a state program administered in partnership with local jurisdictions. Local implementation programs are approved by the Department of Ecology, after which the local jurisdiction is the lead agency for permitting and other regulatory activity. Under the EMC, activities within the Watershed Resource Management Zone require a shoreline permit. The Shoreline Management Program applies to shorelines of the state. "Shorelines" are lakes, including reservoirs, of 20 acres or greater; streams with a mean annual flow of 20 cubic feet per second (cfs) or greater; marine waters; plus an area landward for 200 feet measured on a horizontal plane from the ordinary high water mark; and all associated marshes, bogs, swamps, and river deltas. Floodplains and floodways incorporated into local shoreline master programs are also included. Because PMC generally does not have a flow of 20 cfs, City of Everett officials stated informally that activities within PMC most likely will not be regulated as part of this program. The City of Everett was provided a draft SEPA checklist for the project, along with the IAWP. The City verbally indicated that the conceptual design in the IAWP appeared to meet relevant City requirements. The City will also review the draft and final designs.

City of Everett Grading Code, Title 18.28.200 EMC. Title 18.28 EMC, Land Division Evaluation Criteria and Development Standards, requires a grading plan to be submitted to the city

engineer "before any site modification where existing natural features would be disturbed or removed"[18.28.200(A)]. The EMC establishes minimum standards for clearing and grading, generally based on following "sound engineering techniques." The EMC states, in relationship to environmentally sensitive areas, that "Clearing and grading limits shall be established so as to not impact environmentally sensitive areas, the required buffers, and adjacent properties," [18.28.200(E)(4)] and that "on projects that have environmentally sensitive features and in critical drainage areas, clearing and grading and other significant earth work may be limited to a specific time period as determined by the city" [18.28.200(F)]. The City of Everett was provided a draft SEPA checklist for the project, along with the IAWP. The City verbally indicated that the conceptual design in the IAWP appeared to meet relevant City requirements. The City will also review the draft and final designs.

3.1.3 Action-Specific ARARs

Action-specific ARARs are usually technology- or activity-based requirements or restrictions on actions taken with respect to hazardous substance(s). These requirements are triggered by the particular remedial alternative and set performance, design or other standards that will be used to implement the proposed remedial. These requirements are triggered by the remedial or interim actions selected. The action-specific requirements do not in themselves determine the selected remedial or interim action alternative; rather, they indicate how, or to what level, a selected alternative must be achieved.

Work in and Discharge to Surface Water

Washington MTCA , RCW 70.105D; WAC 173-340-430. MTCA specifies requirements that affect the implementation of interim action at a site. These requirements were described throughout the draft IAWP and are met through submittal of the draft IAWP and the design package.

Clean Water Act's Pretreatment Regulations (40 CFR Part 503.5, City of Everett Code Title 14 Water and Sewers). These regulations and city ordinances are potentially applicable if construction dewatering water is discharged to the City of Everett publicly owned treatment works (POTWs) (including through Boeing's wastewater treatment plant (WWTP), which discharges to the Everett POTW). The federal regulations and city ordinance limit pollutants in wastewater discharges to sanitary sewer systems to protect POTWs from accepting wastewater that would damage their system or cause them to exceed their permit discharge limits. The design includes pretreatment of construction dewatering water to the standards provided by the POTW. The POTW has reviewed and approved the treatment approach and goals included in the design. The POTW approval and the treatment goals are included in Appendix A.

Stormwater Permit Program (33 USC 1342, RCW 90.48.260, 40 CFR 122.26; Chapter 173-220 WAC). Federal CWA as delegated to Ecology under RCW 90.48.260 require that the general stormwater permit be obtained for stormwater discharges associated with construction activities disturbing over 1 acre. The disturbed acreage for this project is 0.2 acres. The substantive provisions of the Washington State General Stormwater Permit for Construction Activities is

potentially applicable to interim action at PMC if it is anticipated that stormwater will flow during implementation of the work activities. No formal coverage or notification to Ecology would be required for this work, which will be performed entirely on-site. Under MTCA only substantive compliance with this Washington State Water Pollution Control Act requirement is required. Substantive compliance with the General Stormwater Permit are met by the design by implementing best management practices (BMPs) and performing appropriate monitoring to ensure that stormwater runoff does not cause an exceedance of water quality standards in a receiving surface water body.

State Environmental Procedures Act, RCW 43.21.036, WAC 197-11-250 through 268. Under the SEPA rules, MTCA and SEPA processes are to be combined to reduce duplication and improve public participation (WAC 97-11-250). Ecology has determined that they will act as the lead agency for implementing the substantive requirements of SEPA as described in WAC 197-11-253. A SEPA checklist has been completed for the IA and will be updated with any new information at the draft and final design stages. The working assumption is that Ecology will determine that the IA will not have a probable significant adverse environmental impact, and therefore a determination of nonsignificance (DNS) will be issued. Under WAC 197-11-268, for MTCA interim actions conducted under WAC 173-340-430 which will not have a probable significant adverse impact and for which a DNS is issued, the public notice of the interim action will be combined with the comment period on the DNS.

Discharge to Air

Washington Clean Air Act and Implementing Regulations (Chapter 70.94 RCW, WAC 173-400-040(8); WAC 173-460); Puget Sound Clean Air Agency (PSCAA) Regulation I, Section 9.15. WAC 173-400-040(8) and PSCAA Regulation I, Section 9.15 requires owners and operators of fugitive dust source take reasonable precautions to prevent fugitive dust from becoming airborne and to maintain and operate the source to minimize emissions. These requirements are applicable to controlling fugitive dust emissions during implementation of the interim action and requirements for dust control have been written into the design specifications.

Hazardous Waste

Resource Conservation and Recovery Act (RCRA) and Washington Hazardous Waste Management Act and Dangerous Waste Regulations (42 USC 6901 et. seq., 40 CFR 260, 261, 262, 263, and 268, Chapter 70.105 RCW, Chapter 173-303 WAC). The Washington State Dangerous Waste requirements and federal RCRA requirements for non-authorized programs are potentially applicable to the interim remedial action if the sediment or soils are determined to be hazardous and/or state-only dangerous waste. These regulations identify the requirements for characterization, management and disposal of waste and contaminated media (i.e., soil and sediment). For on-site management, these requirements are a potential ARAR. For off-site activities, the requirements of the federal RCRA regulations and Washington State Dangerous waste regulations must be fully complied with. Waste and contaminated media must be properly characterized to determine if it is a hazardous and/or dangerous waste under WAC 173-303-070

through 173-303-100 If the wastes or contaminated media destined for off-site disposal are determined to be a hazardous and/or dangerous waste, then the substantive requirements for on-site under Chapter 173-303 WAC would need to be met for the on-site of hazardous and/or dangerous waste. The off-site transportation and disposal of these wastes would need to comply fully with the RCRA and DW waste regulations. Disposition of waste will occur at facilities that are licensed and permitted to accept the specific hazardous waste material. The design calls for Boeing to handle contaminated sediment solids and leachate using the treatment and disposal process already in place for Flightline PCB waste. The contaminated sediments are not expected to be RCRA hazardous or Washington dangerous waste. The sediments are also unlikely to contain sufficiently elevated PCB concentrations to be characterized as TSCA PCB waste. However, Boeing may elect to dispose of the contaminated sediments as PCB waste.

Washington Solid Waste Management Act and Solid Waste Management Handling Standards Regulations (Chapter 70.95 RCW, Chapter 173-350 WAC). The solid waste requirements are potentially applicable to the off-site disposal of solid nonhazardous wastes and contaminated media that may be generated as part of the interim action. For off-site disposal activities, these requirements must be fully complied with. The design requires disposition of waste materials at facilities licensed and permitted to accept the specific waste material.

Interim Action Design Requirements Under MTCA

The requirements for interim action submittals under WAC 173-340-430(7) are met by this Basis of Design Report and Site Management Plan, in combination with the Design Drawings and Specifications. These documents meet the requirements of MTCA in the following ways:

- The description of the interim action and how it will meet the requirements of WAC 173-340-430(1), (2), and (3) (Section 1.1 through 1.4)
- Information from previous investigations (Sections 2.0, 3.2 and 3.3)
- A description of existing site conditions (Sections 2.0, 3.2, and 3.3)
- Alternate interim actions considered (Section 3.5)
- Relevant requirements for design under WAC 173-340-400(4) are met by the design package as a whole
- Compliance monitoring plan requirements (Section 4.10)
- A safety and health plan (Section 4.1 and the referenced Health and Safety Plan)
- A sampling and analysis plan (Sections 5.0 and 6.0).

3.2 DATA SOURCES

Sources of data for design of this IA include:

- The remedial investigation work conducted within PMG (URS 2001, 2002 and subsequent sediment sampling and analysis)
- Investigations and designs related to the stormwater infrastructure at the head of PMC, and other historic data from the Everett plant as a whole
- Pre-design data collection activities conducted under the draft IAWP (URS 2005c)

The nature of the data available from each of these sources is summarized in the following subsections.

3.2.1 Remedial Investigation Data

Remedial investigation data available for this design includes:

- Descriptions of the geology and hydrogeology of PMG
- Engineering characteristics (grain size, etc.) of geologic formations underlying the site
- Estimates of aquifer parameters (hydraulic conductivity, etc.) for the Esperance Sand aquifer underlying the site
- Analytical results of periodic sediment and surface water samples from PMC collected since 1998 and analyzed for PCBs, PAHs, and metals
- Information on the sources of PCBs in PMC, which allows development of a conceptual site model

These data are documented in the draft remedial investigation report (URS 2002).

3.2.2 Stormwater Infrastructure and other Historic Data

Numerous studies have been conducted in PMG related to the construction and modification of the stormwater structures (such as the sedimentation and detention basins), the construction of the peat filter system and created wetlands, and the associated reconfiguration of the head of PMC. Data are available as early as 1968, with the bulk of the data generated in the late 1980s and early 1990s. Most of the investigations available do not focus on the reach of PMC selected for this IA, but some data related to this design are available in each of the following references:

- Report of soils investigation, 1968 (Dames and Moore 1968) – containing logs of geotechnical borings within PMG

- Geotechnical investigation for the water retention dam (Dames and Moore 1988) - containing logs of geotechnical borings within PMG and results of geotechnical analyses of soil samples

- Boeing Everett facility expansion wetland report (The Coot Company 1989) – documenting wetlands present on the facility as a whole

- Mitigation plan for Boeing south 68-acre parcel (Jones & Stokes 1989) – providing a description of PMC conditions in 1989

- Geotechnical investigation of building 40-56 (Dames and Moore 1991) – providing general geotechnical parameters for the subsurface at the facility as a whole

- Design drawings for detention basin spillway and associated structures (Dames and Moore 1989)

- City of Everett SEPA decision regarding Boeing Everett facility expansion (Everett 1991) – describing planned mitigation to be conducted in PMC, including construction of the created wetland

- Addendum to determination of nonsignificance for regrading adjacent to the Boeing South Complex (Snohomish County 1992) – documenting the decision to not enhance fish habitat in the reach of PMC on Boeing property because such enhance was determined to not be feasible

- Boeing Everett expansion mitigation baseline (Dames and Moore 1992) – providing a habitat and organism baseline prior to construction of PMC bank stabilization structures and the engineered stream channel from the created wetland to PMC

- City of Everett memorandum regarding salmonid utilization of streams in Everett (Daley 1993) – documenting the absence of fish in one lower reach of PMC, and the stream characteristics that would make fish utilization difficult

- Evaluation of sediment issues in PMC (Exponent 2002) – providing the basis for the conceptual site model for PMC

- City of Everett benthic invertebrates monitoring report (Everett 2005) – documenting benthic invertebrates in Everett streams, including PMC

3.2.3 Pre-Design Data Collection Activities

Topographic Survey

In order to obtain more detailed and accurate topographic data for the portion of Powder Mill Gulch on Boeing property and downstream of Seaway Boulevard, a light detection and ranging

(LiDAR) survey was completed by Terrapoint under subcontract to URS. The field data collection took place from October 19th, 2005 to October 22, 2005. The LiDAR survey data was collected using a helicopter mounted LiDAR unit in NAD83 geographic units (latitude, longitude) and ellipsoid heights, then converted to the required grid. The horizontal datum is NAD83/91 Washington State Plane, North Zone and the vertical datum is NAVD88. Terrapoint processed the data using their standard methodology to separate interpreted bald earth points from other above-ground objects such as vegetation, buildings etc.

The bald earth point data was provided to URS, whom converted the data into the NGVD29 vertical datum to be consistent with prior ground surveys data for the Everett Plant and produced a topographic map. The LiDAR provided improved overall topography and detail relative to the existing City of Everett topography; however there was insufficient point data within the creek channel due to overhanging vegetation to obtain the detail needed for hydraulic modeling and restoration design. Therefore, the LiDAR data was supplemented with a ground survey performed by licensed surveyors, Reid Middleton.

Ecological Reconnaissance

A preliminary site visit was conducted by a URS biologist on August 2, 2005. The 750 feet of PMC between the stormwater detention pond spillway and Seaway Boulevard was walked, along with the access road along the west bank of PMC. During this survey, visual observations were made for general habitat characteristics and the presence of fish and wildlife species.

On December 6, 2005, two URS biologists conducted baseline surveys of PMC and the surrounding riparian habitat. The baseline survey utilized, as applicable, the:

- Washington Timber, Fish, and Wildlife (TFW) protocols
- California Stream Habitat Restoration Manual protocols
- U.S. Forest Service (USFS), Region 6 stream survey protocols
- USFS, Region 10 Channel Type Guide

TFW large woody debris (LWD) survey protocols were used to survey wood present in the stream and the stream channel was mapped utilizing TFW methodologies, with supplementation from the California Stream Habitat Restoration Manual, and USFS stream survey protocols and Channel Type Guide. A fisheries biologist directed an electroshock survey of the stream channel above Seaway Boulevard on Boeing property for the presence and identification of fish species.

A botanist assisted in the survey to access the riparian forest and vegetation and mapped the mean high water mark. The botanist will work with a landscape architect during the design phase to develop a revegetation plan.

Pre-Design Geotechnical Reconnaissance

In accordance with section 6.2.2 of the IAWP (URS 2005c), a URS geotechnical engineer conducted reconnaissance site visits to PMG on November 17th and December 6th, 2005. The

primary purpose of these visits was to assess the current geotechnical conditions in PMG as they relate to the proposed work. While on site the geotechnical engineer also assessed site characteristics with regard to construction logistics (e.g., potential laydown areas, water treatment options).

Vertical Profile of PCB Concentrations

In accordance with section 6.2.3 of the IAWP (URS 2005c), URS personnel advanced a total of five soil borings (at existing locations SED-PMG3A through SED-PMG3D and SED-PMG20) along the bed and banks of Powder Mill Creek (Figure 3). This work was conducted on November 17, 2005, using a hand auger, post hole digger, and shovel. The target depth of each boring was 2 feet below ground surface (bgs); however, refusal was encountered at depths shallower than 2 feet bgs in several of the borings. Samples were collected at six-inch intervals to the total depth of the borings. Boring depths and sample collection intervals are summarized in Table 1.

Refusal at location SED-PMG3A was the result of constant seepage of water into the borehole, which destabilized the sidewalls. Refusal at locations SED-PMG3B and SED-PMG3C was because of rip-rap at this location. Samples to be analyzed for grain size distribution were collected from borings SED-PMG3B and SED-PMG20 at the 1.0 to 1.5 feet bgs depth interval. A field duplicate sample (SED-PMGDUP1-051117) was also collected from the 1.0 to 1.5 feet bgs interval from boring SED-PMG20.

The soil samples were submitted under chain-of-custody to Analytical Resources Incorporated (ARI) of Tukwila, Washington, an Ecology accredited laboratory. The samples were analyzed for PCBs in accordance with EPA Method 8082 and for total organic carbon (TOC) and total solids. The sample results are reported in Table 2.

All digging and sampling equipment was decontaminated between sampling locations using a dilute Alconox solution and deionized water rinse. An equipment rinsate sample (SED-PMGEB1-051117) was collected at the end of the field day and submitted to the laboratory for analysis for PCBs. The IAWP called for the rinsate sample to also be analyzed for TOC, but the sample volume was insufficient for this additional analysis.

3.3 GEOLOGY, HYDROGEOLOGY, HYDROLOGY, AND ECOLOGY

3.3.1 Geologic and Geotechnical Conditions

Geology

The reach of PMC selected for this interim action is underlain by the Esperance Sand geologic unit, which is locally capped with alluvium within and adjacent to the active creek channel. Alluvium is also present as a relatively thin veneer capping terraces cut into the Esperance Sand. The Esperance Sand consists primarily of fine to medium brown sand, with minor amounts and occasional lenses of silt and gravel. The Esperance Sand thickness varies significantly in the PMG

area depending on the surface elevation. At the area of the interim action, the Esperance Sand is approximately 110 feet thick.

A distinct, hard clay and silt bed is interbedded within the Esperance Sand. It is typically 4 to 5 feet thick and occurs approximately 35 feet above the base of the Esperance Sand. The silt bed pinches out underneath the detention basin and outcrops along Powder Mill Creek north of Seaway Boulevard. It also is exposed on the west side of the creek further downstream. The Esperance Sand is underlain by Lawton Clay, a hard clayey silt of glaciolacustrine origin. The Lawton Clay is a regional aquiclude (USGS 1997). The Lawton Clay outcrops within the creek channel and valley slopes approximately 2,200 feet downstream of Seaway Boulevard.

Pre-Design Geotechnical Assessment

The stream banks in the area of interest consist of alluvial sands with gravel or Esperance Sand. Some fines were associated with the sandy banks, but the amount of fines generally appeared to range between 3% and 20%. Soils in stream bed and bank borings were found to be generally loose-to-medium dense, fine-to-coarse sand with varying amounts of gravel and small cobbles and little silt and clay. The grain size distribution of selected samples taken from the stream bed indicates that the soils are about 10% to 25% gravel, 60% to 85% sand and 2% to 12% silt and clay. Grain size distribution data are provided in Appendix B.

Anthropogenic fill (rip-rap) was observed at locations PMG3C and PMG3B. Refusal was encountered at these locations due to the difficulty of advancing the digging tools down-hole past the rip-rap. Additionally, sediment was preferentially eroded from in between the rip-rap clasts, precipitating frequent cave-in of the borehole sidewalls.

No seeps emanating from the stream banks were noted along the stretch between the spillway structure and 200 feet downstream of the structure, implying that there are no layers of low permeability material near the streambed elevation along the portion of the streambed selected for this interim action. Additional water was entering the creek bed just north of the outfall from the constructed wetland.

Stormwater is discharged to the creek via two approximately 18 inch outlet pipes from the detention basin spillway. The spillway consists of a wide downchute with a concrete walled stilling basin, which acts as an energy dissipation structure, at its base. The overall stream channel is in the approximate shape of a bowl in the first 30 feet downstream of the stilling basin structure and it is about 30 feet wide in this location. The channel narrows to about 15 to 20 feet wide and is more constricted downstream.

Slopes are moderate on the west bank of Powder Mill Creek and approach 1:1 (H:V) in the section near the stilling basin. Further downstream, most of the slopes average about 40% although there are occasional isolated areas steeper than 1:1. Rip rap up to 2 feet in diameter is predominantly be present on much of the west bank to a height of about 8 to 10 feet above the stream bed to a point about 200 feet downstream. The average size of the rip rap appears to be in the 10 to 12-inch range. In some areas it was not observed and was possibly missing or covered by vegetation.

Wood cribbing is along the west bank, starting about 200 feet from the stilling basin and continuing downstream. The cribbing is about 4 feet high and apparently tied into the slopes with tie-back straps and anchors of some type. No apparent geotechnical problems were associated with the west bank provided the cribbing is not removed. This bank appeared to be relatively stable and should remain stable with light construction loading.

The east bank of Powder Mill Creek has moderate slopes of about 40% from the stilling basin to a point about 30 to 40 feet downstream of the structure. The upper portion of the slope becomes flatter as it continues eastward at an elevation about 13 to 15 feet above the streambed. Rip rap was observed on these slopes to a height of about 8 to 10 feet above the streambed.

From about 30 feet to about 200 feet from the stilling basin, the east bank is heavily eroded with vertical banks. There is active bank erosion into the streambed in this area. There is a 3-foot high wooden weir at a location about 110 feet downstream of the overflow structure. At this point, the stream section is restricted to about 20 feet wide and the stream has been directed to the east around the weir. The east bank is about 13 feet high, nearly vertical and extends to the northeast in a meander cut past the end of the weir. Above the steep bank, the ground slopes upward to the east at about 10% grade.

The nearly vertical banks along portions of the east side of the creek are due to an inter-particle structure in the sand and gravel matrix of the Esperance Sand resulting from over consolidation from glacial ice during the Vashon glacial stad. This structure is weathered within the top few inches of the surface and easily disturbed or eroded. Below the surface, the weathering is less pronounced and the inter-particle structure provides more strength. The sand and gravel particles in the banks are sub-rounded and friction angles would be expected to be about 32° to 35°. Excavation into these banks could result in slope failure depending on the degree of inter-particle structure in the area. Extra caution should be used when construction equipment is operating near these banks and these should not be undermined by sediment excavation.

During sediment characterization, disturbed sediment samples were obtained from stream bed locations PMG-3B and PMG-20 within the vicinity of materials to be excavated, at depths of about 1.0 to 1.5 feet below stream bed elevation. A sieve analysis was conducted to determine grain size distribution of the sediments. The samples classified as clean to slightly silty, well graded sand with gravel (SW-SM) with some poorly graded sand with gravel (SP). The percentage of fines (silt and clay size particles) in the samples ranged from about 2% to 12%. Local observations and historical boring data in the stream area indicate a similar dense sand with slightly less gravel and slightly more silt content. The material adjacent to the streambed in the stream sideslope exposures is typically classified as silty sand (SM).

Based on the laboratory testing and streambed observations, the material to be excavated is relatively free draining and typical of alluvial deposits in the area at elevation 325 to 328 (approximate streambed elevation in the area to be excavated). It is anticipated that the natural material in the streambed will drain rapidly.

Locally, sediments deposited on the streambed surface may contain more fine material. When the sediments are mixed with the natural streambed material during excavation activities, the time for drainage to meet moisture criteria for off-site disposal may increase. It is expected that the excavated materials will drain to required moisture content in a few days.

3.3.2 Hydrogeology

Groundwater within the Esperance Sand is unconfined, and occurs at a depth ranging from approximately 182 feet bgs at the head of PMG to ground surface in some reaches of PMC, where groundwater daylights in and near the creek as seeps and springs. Groundwater level elevations have been measured in the PMG Esperance Sand wells quarterly since each was installed and the data are summarized in the draft RI, where a groundwater contour map of upper PMG is also provided.

Based on the measured elevation data, groundwater flow beneath the Everett Plant and uppermost portion of PMG to the sedimentation basin is to the north-northwest. The gradient beneath the Everett Plant is approximately 12.5 feet/mile or 0.002. However, from the sedimentation basin north, the groundwater flow is from the slopes towards the floor of the gulch and Powder Mill Creek and then parallel to the creek. The gradient progressively increases to 0.028 beneath the gulch floor. The horizontal hydraulic conductivity of the Esperance Sand aquifer is in the range of 6.1 ft/day (mean of site samples from this unit) to 42 ft/day (regional median value, USGS 1997). The effective porosity of this unit is 33.7 percent (mean of site samples from the Esperance Sand).

Groundwater elevation data are available from monitoring wells located near the project area for a period of several years, with measurements collected during different seasons. Data from wells EGW075 (located adjacent to the stilling basin and toe of the detention basin dam) and EGW084 located approximately 440 feet downstream from the spillway are most relevant to the location of the IA. At EGW084 the groundwater elevation has historically been approximately 321-322 feet above msl. At EGW075 the groundwater elevation has been approximately 325-326 ft. Comparing these elevations to the creek elevations in the PMC reach selected for IA, it appears that groundwater can be expected to be between 0 and 6 feet below ground surface throughout the reach. Thus, depending on the actual elevation at the time of excavation, shallow excavation has the potential to intersect the top of the water table over at least a portion of the project reach.

During the pre-design sampling, seepage was encountered in the hand-excavated soil borings between 0.1 and 0.4 feet bgs. The reach of PMC selected for this IA was flowing at the time of the sampling, and the observed seepage is likely to have been water from the creek flowing through the sediment. In general, shallow soils in the creek bed appear to exhibit a high permeability. Based on field observations recorded during the hand excavating, groundwater flow into the open boreholes from the boring sidewalls was estimated to be on the order of several liters (perhaps 1 to 5) per minute.

3.3.3 Hydrology

This section summarizes the precipitation and runoff characteristics of the project reach of PMC. The existing hydraulic conditions of the project reach are summarized in Section 3.11.

Rainfall in the Everett area is very seasonal. Table 3 lists a summary of monthly and daily rainfall totals (WRCC, 2006) for a station near the project site, but at an elevation several hundred feet lower. These data provide an indication of the rainfall that may occur at the project site during construction.

The approximate 24-hour rainfall versus return frequency (NWS, 1973) is provided in Table 4 for the project site.

Stream flow in the project area is primarily from two sources: one is the outflow from the detention pond, which is a maximum of 49 cfs (see Section 2.2). The other is runoff from the adjacent hillsides. Based on previous instream flow measurements by URS, perennial flow downstream of the project reach is on the order of 1 to 2 cfs and dry season base flow within the project reach, if any, is on the order of 0.1 cfs. The basin area that drains directly to the stream (rather than the detention pond) within the project vicinity is 1.8 acres in several sub-basins. Examination of the topography shows a larger sub-basin of 4.7 acres that flows via undefined channels into the stream just downstream of the project site. This area was included to check for potential inflow significant enough to cause a backwater effect at the site.

Using the rainfall of Table 4 and the methods of TR-55 (NRCS, 1986), runoff from the adjacent hillsides was estimated. Even with very conservative input parameters, all runoff calculations totaled less than 5 cfs. Thus, the defining design event for the stream channel is the release rate from the detention pond via the discharge structure.

3.3.4 Ecology

Site visits by URS biologists on August 2 and December 6, 2005 and prior surveys conducted in the PMG wetlands and along PMC (J.S. Jones and Associates 1997; Jones & Stokes 1989; Dames & Moore 1992; Exponent 2002) have provided a good understanding of the habitats present and the receptors that occur or potentially occur in those habitats. Categories of ecological receptors that are potentially affected include wetland plants, terrestrial plants, aquatic invertebrates, fish, reptiles and amphibians, birds, and mammals. Each category may encompass a range of species and functional groups that differ by habitat utilization and preferred foods. The receptor categories are discussed in greater detail in the following sections to highlight the potential receptors that are most likely exposed, and the primary exposure pathways.

Wetland plants predominate on the peat filter, where species such as reed canary grass and rushes are common, and also in the mixed created wetlands where open water is vegetated with stands of bulrushes and sedges. Deciduous trees, primarily willows and alders, fringe the wetland and grow in stands on constructed islands in the lower mixed wetlands. Pathways to wetland plants are more important than those to terrestrial vegetation, including trees, because of the closer association between wetland plants and water or sediments of the created wetlands. The plant community in PMC downstream of the wetlands has not been characterized, but there is extensive riparian vegetation, and streamside wetlands are suspected to occur. Plants are potentially exposed to PCBs via uptake into the roots from sediment and uptake from water can be a minor route of exposure for aquatic plants.

Aquatic and riparian habitat data was collected during the December 6, 2005 survey by URS biologists. Red alder was the dominant riparian tree; with *Sitka Willow, Douglas-fir, western hemlock*, and *bigleaf maple* also present in small numbers. Dominant riparian shrub species were *salmonberry, trailing blackberry,* and *Himalayan blackberry,* with *red-osier dogwood ocean spray, multiflora rose, hardhack, blackcap raspberry, western redcedar, red elderberry* also relatively common. Herbaceous plant species present in the understory included *sword fern, foam flower, bittercress giant horsetail, deer fern, bracken fern, bedstraw, and youth-on-age.* Canopy cover is primarily provided by mature alders on the east bank and red alders and Douglas-fir saplings on the west bank.

3.3.4.1 Creek Habitat

Biological surveying extended downstream from the stilling basin. Reach 1 (Figure 4) is approximately 50-feet long and flows through a floodplain up to about 45-feet in width, giving a bowl shaped appearance. This reach appears to have flow only during periods of heavy precipitation, when water is discharged from the two outlet pipes on the west bank or the spillway. The sideslopes are steep (30 to 50%) and covered with riprap up to 2 feet in diameter that extends 6- to 10-feet up from the floodplain. There is a terrace on the east bank about 20-feet above the floodplain. There is a similar terrace above the west bank, with an access road at the top of the bank where a constructed peat wetland filter boarders the west side of the access road. These terraces extend downstream along PMC to Seaway Boulevard. The entire floodplain, with the exception of a 10- to 14-feet wide channel on the west side that appears to have been created by the flow from the two outlet pipes, seems to be covered with boulders approximately the same size as the riprap. There is a second channel about 15-feet wide that begins at the stilling basin wall on the east side of the floodplain.

An island approximately 15-feet wide separates the two channels. The island is heavily vegetated with red alder and willows. The channels join about 50 feet downstream, with the stream gradient increasing sharply at the downstream end of the boulder covered floodplain. The first 25 feet of the west channel consists of a pool about 14-feet wide and 14-inches deep at the time of the survey (bankfull depth appears to be approximately 2-feet). The substrate of the pool is approximately 45% boulder, 45% cobble, and 10% sand. The remaining 25-feet of west bank channel is a 5-inch deep riffle flowing over a 50% boulder, 50% cobble substrate. The east channel only appears to

contain water during periods when larger flows are discharged over the spillway and the substrate consists almost entirely of boulders. During periods of high flows, the island between the two channels is likely inundated. Stream gradient in reach 1 is about 0.5% and there is no large woody debris (LWD) present in the channel.

Reach 2 (Figure 4) flows along the west side of a 20- to 30-feet wide floodplain for about 60 feet with a stream gradient varying between 3 and 5%. There is riprap along the entire length of the westbank, extending about 4- to 6-feet up the sideslope. There is no riprap present on the eastbanks, which are nearly vertical and eroding where the stream channel comes in contact with the sideslope. The channel has a bankfull depth (BFD) of about 2 to 3 feet and a bankfull width (BFW) of approximately 10 to 14-feet. Most of reach 2 consists of riffle habitat with a substrate consisting of 50 to 90% boulder, with 10 to 40% cobble, 0 to 5% gravel and 0 to 10% sand. Water was only present in pools. There is very little LWD present in the channel, with only 4 unanchored red-alder trunks < 6-inches in diameter present within the channel. There is one 8-inch diameter red alder log at Sampling Station PMG-3A, spanning the creek about 60-feet downstream from the spillway. The log is suspended about 3-feet above the stream and goes from bank to bank. Directly below the suspended log is a 10-foot long pool approximately 5-inches deep, with a substrate of 20% cobble, 5% boulder, 70 % gravel, and 5% sand. The tailout of the pool is about 1-inch deep.

The rest of reach 2 consists of a riffle about 2-inches deep with two small pools. These pools are at a small bend in the stream channel starting about 85-feet downstream from the spillway where the channel bends to the west and back again to the east for about 20 feet, to flow around a small ridge on the eastern terrace that is perpendicular to the stream channel. There is a string of boulders immediately opposite the end of the ridge that extend to and up the westbank. Both pools occupy the west half of the channel and are located immediately above and below where the ridge extends to the edge of the stream channel. The pools are about 6-feet in diameter. The upstream pool is about 6 inches deep and has a gravel substrate, while the downstream pool is about 8-inches deep and has a substrate composed of 80% cobble, 10% gravel, and 10% sand. At the downstream end of reach 2 (about 110-feet downstream from the spillway), a 3-feet high log weir marking the end of reach 2 extends part-way into the stream channel from the westbank.

At reach 3 (Figure 4), the stream channel is directed to the east around the weir and flows alongside the east bank for about 50 feet, eroding the terrace and forming vertical banks 10- to 20-feet high. The floodplain widens to the east in reach 3, to a width of about 50-feet or more. The terrace on the westbank is approximately 6-feet above the bankfull elevation of the stream. The floodplain is about 30- to 40-feet wide throughout reach 3. The stream gradient decreases to about 2% and the channel consists entirely of a 2-inch deep riffle about 12-feet wide. Low flow width of the channel is about 4 feet. BFD is about 2 feet and BFW probably extends across the 30- to 40-feet width of the floodplain because there is evidence of a second high flow channel along the west bank. The substrate of reach 3 is about 5% boulder, 90% cobble, and 5% gravel. There was no LWD present in the reach.

A detailed survey of the creek downstream of reach 3 was not conducted, but a general description follows. The floodplain narrows to about 20- to 30-feet in width below reach 3 about 161 feet below the stilling basin. The stream channel returns to approximately the middle the floodplain and consists primarily of riffles, with a few small pools. LWD becomes more common in PMC below the surveyed reach. The stream becomes perennial below the outfall from the lower created wetland, but summer low flows are probably < 0.1 to 0.2 cfs in the channel above Seaway Boulevard.

3.3.4.2 Wildlife Survey

From the stilling basin, PMC flows northerly about 750 feet to Seaway Boulevard. Where it passes through a 250-foot long, 48-inch diameter round culvert. Additional culverts are located further downstream at Mukilteo Boulevard and the Burlington Northern Santa Fe (BNSF) railroads tracks at the mouth of the creek. No fish have been documented in the stream between Mukilteo Boulevard and Seaway Boulevard (Jones & Stokes 1989; City of Everett 1993; Crane 2005) or in the reach above Seaway Boulevard (Jones & Stokes 1989; Dames & Moore 1992). Although resident fish may have been historically present in PMC above the BNSF culverts, they have not been documented above Mukilteo Boulevard and their absence on Boeing property above Seaway Boulevard has been confirmed by numerous electrofishing surveys.

The absence of fish in PMC and in the constructed wetlands on Boeing property is largely due to the presence of several impediments to fish passage downstream of Seaway Boulevard. PMC is conveyed under the BNSF railroad tracks through twin 48-inch concrete culverts (one of which is blocked with debris) with about a 3% gradient that empty into Port Gardner Bay in Puget Sound. The outlets of the culverts are at an elevation of about +13 feet (Mean Lower Low Water) and discharge from the unblocked culvert creates a 4-foot fall from the culvert outlet to the embankment quarry spawls during low tide. The height of the unblocked culvert outlet is too high for backflooding except during the highest tides, thus rending the culvert unpassable to fish except for very short time periods several times a year. Access by resident and anadromous fish to stream reaches above Mukilteo Boulevard is precluded by a culvert under Mukilteo Boulevard, which is located 1,200 feet upstream of tidewater. Coastal cutthroat trout have been reported during electrofishing surveys downstream from Mukilteo Boulevard, but no catches have been reported from above the boulevard (Jones & Stokes 1989).

Priority Habitats and Species Maps provided by the Washington Department of Fish and Wildlife do not list any anadromous fish presence in PMC, but the entire creek from the stilling basin outlet to Puget Sound is mapped for the presence of priority resident fish (resident coastal cutthroat trout) (WDFW 2005). Although coastal cutthroat trout may have been historically present in PMC, the presence of coastal cutthroat trout in PMC above Mukilteo Boulevard has not been documented by surveys conducted since 1980 and all fish have been documented to be absent in PMC above Seaway Boulevard in three electrofishing surveys conducted between 1989 and 2005 (Jones & Stokes 1989, Dames & Moore 1992, and this report). The Washington Conservation Commission WRIA 7 Salmonid Habitat Limiting Factors Analysis Report states that a velocity barrier is present a short distance upstream from the railroad tracks at the marine shoreline (Haring, 2002).

A preliminary site visit was made a URS biologist on August 2, 2000 to the reach of PMC between spillway of the stormwater detention pond on Boeing Company property and the mouth of the 250-foot culvert where the stream flows under Seaway Boulevard. No fish were observed during the site visit. PMC was electrofished from the stormwater detention pond spillway to the culvert at Seaway Boulevard by URS biologists on December 6, 2005. No fish were detected during the survey. The culvert at Seaway Blvd is a complete barrier to the upstream passage of fish and only 750 feet of stream is present above the culvert. Stream flows in this reach are intermittent or extremely low during the low flow months, but flows can exceed 40 cfs when water is discharged over the spillway. If fish ever were present above Mukilteo Boulevard, it is likely that they were extirpated in the reach above Seaway Boulevard by stocastic events, such periods when the stream channel has gone dry. With no access through the culvert at Seaway Boulevard and no known population of fish between Seaway Boulevard and the culvert downstream at Mukilteo Boulevard, there is no opportunity for fish to either recolonize the reach of the stream above Seaway Boulevard or to utilize the reach as intermittent habitat during seasonal periods of flow. If fish are present in the creek, the most important exposure pathways would be ingestion of sediment and prey, with exposure to PCBs in water likely representing a minor exposure route.

No systematic survey of benthic or water-column invertebrates has been conducted, but communities are likely to occur in the created wetlands and in PMC. B-IBI scores for PMC conducted in the vicinity of Mukilteo Boulevard downstream from the project site had no statistically significant difference between the poor and fair categories (City of Everett 2005). Invertebrates were sampled during 1992 by Dames & Moore (1992) in riffles at five stations in the study area using a surber sampler with a one foot square frame. Two artificial substrate samplers were also placed at each station (Dames & Moore 1992). The closest sampling station to the project site was located 250-feet downstream from the stilling basin. The dominant invertebrates were Annelid worms (371 for all stations), followed by the order Diptera (mostly midges of the family *Chironomidae)* numerically close behind. No mayflies or stoneflies were observed and only 1 caddisfly was collected. Colonization of accumulated solids and water in the sedimentation and detention basins is possible, but given the fluctuating water levels in these structures and the annual emptying and removal of solids, stable invertebrate communities are unlikely. Benthic invertebrates are primarily exposed to PCBs via ingestion of sediment, with contact representing a minor exposure pathway. Exposure via ingestion of water and prey are less important pathways for all invertebrates.

Previous site investigations and site visits by URS biologists have documented the presence of several amphibian species (Pacific chorus frog, rough-skinned newt, northwestern salamander, long-toed salamander, northern red-legged frog) and reptilian species (garter snakes) in the wetland area, although others may also occur. Of these species, amphibians, such as frogs and salamanders, are more likely to be exposed to PCBs in wetland sediments, as they spawn in ponds and young develop and undergo metamorphosis in the ponds. Exposure to PCBs in sediment and prey would be the most important pathways for amphibian receptors. Pathways are likely incomplete to terrestrial reptilian species that are not closely associated with wetland habitats.

Numerous bird species have been observed in the created wetland area, as summarized by J.S. Jones and Associates (1997) and in previous site visits by Exponent (Exponent 2002) and URS biologists in 2005. Many of these species are songbirds that are more strongly associated with the terrestrial vegetation fringing the wetland than the wetland habitats. However, waterfowl species, such as green-winged teal, and shorebirds such as killdeer and spotted sandpiper could forage in wetland habitats on aquatic plants or aquatic invertebrates. The absence of fish in the created wetlands and in PMC indicates that use by bird species that prey exclusively on fish would be limited. A 2002 site visit conducted by Exponent also documented the presence of waterfowl and killdeer in the detention basin. However, the absence of any vegetative habitat structure and permanent food source in this basin indicates that birds are probably using it as a loafing area rather than a foraging area, so exposure is not likely to be important at this location. No avian survey has been conducted downstream in PMC, but based on the habitats present, numerous bird species, such as American dipper are expected to be present including some that may forage for prey in aquatic habitats. Exposure to PCBs in prey is the major exposure route for birds, but sediment exposure may also be important, especially for species that probe sediments to forage for invertebrates.

Mammal species that are known to occur in the area surrounding PMC include small rodents (voles, mice), which inhabit grassy terrestrial areas, and mountain beaver. Raccoons and mink may rely on invertebrates and amphibians in the wetland and PMC as a food source. Mink have not been observed in the wetland, but habitat in the created wetlands and along the PMC riparian corridor would be suitable for this species. However, the lack of fish, which constitute a significant part of their diet, may limit their occurrence. As with birds, exposure to PCBs in prey is the major exposure route for mammals, but sediment exposure may also be important.

3.4 SOURCE, NATURE, AND EXTENT OF CONTAMINATION

3.4.1 Contaminant, Affected Media, and Release Model

The contaminants of interest for this IA are PCBs (primarily Aroclor 1254), which are present in sediment in the bed of PMC, either as free PCBs or encapsulated within Flightline joint compound particulates. The primary release mechanism that has resulted in PCBs in PMC sediment appears to be weathering of Flightline joint compound (see also Section 2.3) that contained PCBs. The weathered joint compound particles appear to have traveled through the facility stormdrain system with some released to PMC over time. The working assumption for this release model is that PCB releases are likely to have been more prevalent prior to 1991 than currently, because the storm water treatment system was substantially upgraded between 1989 and 1991, in compliance with mitigation agreements with the City of Everett. The current configuration of the storm water system includes significantly more detention time to facilitate settlement of solids than the initial system provided, as well as filtering of a substantial amount of the stormwater through the peat system.

Sediment samples in PMC were first collected in October 1998 and subsequent samples have been collected intermittently through June 2005 at various locations from near the detention basin

spillway outlet (PMG3) to the mouth of Port Gardner Bay (PMG45). These samples have generally been collected from near the surface of the sediment in the creek bed. As described in Section 3.2.3, depth-specific sediment samples were collected during pre-design data sampling in November 2005. These samples were collected from five locations (Table 2) and were used to assess the vertical distribution of PCBs in creek sediment in the proposed area of this IA.

In addition to creek sediment samples, accumulated solids samples were collected from the sedimentation and detention basin in conjunction with the annual basin dewatering and cleanout by Boeing starting in September 1999 through June 2005. Sediment and accumulated solids samples were collected by URS personnel and analyzed for polychlorinated biphenyls (PCBs) by EPA Method 8082 at Analytical Resources, Inc. (ARI), a Washington State Department of Ecology accredited laboratory located in Tukwila, Washington. These data were reviewed and validated in accordance with the QAPP included in the draft IAWP and were found to be useable for the purposes of this project. Accumulated solids samples were also collected on an irregular basis by Boeing personnel and analyzed for PCBs prior to 1998. Sample locations with analytical results are shown on Plate 1 and analytical results for PCBs are summarized in Tables 2 and 5.

Summary of Historic PCB Concentrations in Surficial Sediments

PCBs, primarily Aroclor 1254, have been detected in surficial PMC sediment at locations from the detention basin spillway at the head of PMC (PMG26) to the mouth of the creek at Port Gardner Bay (PMG45). Historic PCB concentrations detected in PMC sediment on Boeing property have ranged from 51 µg/kg to 6,900 µg/kg. PCBs concentration in sediments collected downstream of Seaway Boulevard ranged from not detected at 19 µg/kg to 680 µg/kg. In 1998, the highest Aroclor 1254 concentration measured in PMC sediment was 6,900 µg/L. The highest Aroclor 1254 concentration measured in PMC sediment samples collected in November 2005 was 620 µg/L.

In general, the highest concentrations of Aroclor 1254 have been detected in sediment samples collected between PMG3B, which is located approximately 35 feet downstream of the stilling basin outlet and PMG20 located approximately 200 feet downstream of the outlet. Analytical results for the most recent samples in 2005 consistently show a substantial decrease in PCB concentrations in sediments in this reach of the creek. For example, at sample location PMG20 2005 concentrations range from 51 µg/L to 140 µg/L compared to a historic high of 3,700 µg/L. At PMG-3, the 1998 concentration of 6,900 µg/kg decreased to 280 µg/kg in 2004.

Results of Vertical Profiling of PCB Concentrations

Overall, the vertical profiling data show that PCB concentrations exhibit an order of magnitude decrease from the 6-inch to the 12-inch deep samples at the four locations were vertical sampling was completed. Because of the mechanics of the sediment sampling in PMC, historic results from "surficial" sediment samples are most representatively compared to the 6-inch deep samples from the vertical profiling effort. The shallow sample results indicate that PCBs are present at concentrations of several hundred µg/kg in the upper 6-inches of sediment in the headwater reach of PMC. Concentrations consistently drop to several tens of µg/kg at a depth of 12 inches.

At the four sampling stations where vertical profiling was conducted, PCB concentrations in the 6-inch samples ranged from 140 µg/kg (PMG20) to 620 µg/kg (PMG3B). The 12-inch sample results ranged from not detected at 19 µg/kg to 39 µg/kg. The 18-inch sample results ranged from not detected at 19 µg/kg to 40 µg/kg. PCBs were not detected above 19 µg/kg at either of the two stations where a sample from 24 inches was successfully recovered.

Comparing the data from the November 2005 vertical profiling effort to the most recent previous surface samples (January, June, or August 2005 depending on the location) indicates a decrease in concentrations at locations PMG3C and PMG3D. PCB concentrations increased at locations PMG3B (from 510 µg/kg in August 2005 to 620 µg/kg in November 2005) and PMG20 (from 51 µg/kg in June 2005 to 140 µg/kg in November 2005). The apparent changes in PCB concentrations at locations PMG3B, PMG3D, and PMG20 may simply be the result of the inherent variability in sediment sampling for PCBs. However, the apparent PCB concentration decrease at PMG3C from 1,200 µg/kg in January 2005 to 190 µg/kg in November 2005 is large enough that it may reflect an actual decrease in PCB concentration in sediment at this location.

The vertical profile sampling did not succeed in collecting samples to a depth of 24 inches at all sampling locations, as discussed in Section 3.2.3, in part because of the presence of buried riprap boulders at some locations. Based on this result, it appears that sediment containing PCBs is, in some portion of PMC, present overlying shallow riprap.

3.4.2 Fate and Transport

PCBs preferentially bind to organic materials in sediments and have low solubility in water. The Flightline joint compound itself is a lipophilic material and would be expected to similarly bind to organic materials in the stream bed. Particulates of Flightline joint compound encapsulating PCBs are probably also present as free particles not bound to sediment. Both free and bound PCBs and joint compound particulates move and redistribute with the bedload and suspended load sediments to varying degress as the PMC flow varies seasonally. PCBs are relatively stable in the environment and biodegrade slowly. PCBs can accumulate in biota and biomagnify through the food chain; therefore, exposure risk may increase for higher-trophic level receptors.

3.4.3 Conceptual Site Model Summary

The ecological and human health conceptual site models (CSMs) were discussed in detail in the draft IAWP (URS 2005c). The subsections that follow include brief summaries of the exposure pathways analyses for each of these two CSMs. The CSMs are also summarized in Figures 5 and 6.

Ecological Conceptual Site Model

There are numerous ecological receptors that either occur or could potentially occur in the constructed wetland area or downstream reaches of PMC. Depending on the distribution of PCBs in these habitats, complete exposure pathways may exist to some or all of these receptors. The

exposure pathway analysis is summarized in the diagrammatic ecological CSM shown in Figure 5, where exposure pathways to the most-likely exposed receptor groups are illustrated.

Human Health Conceptual Site Model

The creek is small with relatively difficult access because of thick undergrowth in most areas (except immediately north of Seaway Boulevard on City of Everett property). Access to the area through the Boeing facility is prevented by strict facility security and chain-link fencing along Seaway Boulevard. The City of Everett has designated the parts of PMG owned by the City as "Park/ Public Open Space" in their comprehensive land use plan for the City. It is Boeing's understanding that the City has long term plans to develop some of PMG as a park; however, no specific development plans or schedule are currently available. Therefore, there are no current "developed" uses of PMG and no immediate plans for development.

The available data indicate the creek does not support fish or shellfish that people would be likely to consume. As previously discussed in Section 3.4, anadromous fish do not have a means of reaching the middle and upper portions of this small waterway from Port Gardner Bay because of the presence of physical barriers downstream that inhibit fish passage. Fish were not found in the reach of PMC on Boeing property (upstream of Seaway Boulevard) during the electrofishing survey conducted as part of the pre-design sampling for this IA (Section 3.4).

Given the nature of the site, exposures resulting from contact with sediment and surface water during recreational visits by an older child or an adult were determined to have the greatest potential for human exposure. Site access on Boeing property is limited as indicated above and access to the creek north of Seaway Boulevard is somewhat limited by dense undergrowth, steep sideslopes of PMG, and lack of adjoining residential yards to the creek. Therefore, a young child would not be expected to visit.

The following exposure pathways are considered to be complete:

- Ingestion and dermal contact with sediments by an older child or adult
- Ingestion or dermal contact with water by an older child or adult.

The human health CSM is summarized in Figure 6. Exponent (2002) evaluated risks associated with the two complete exposure pathways for an older child. A complete discussion of the risks calculated is provided in the Exponent (2002) document, with a summary in the draft IAWP (URS 2005c).

3.5 INTERIM ACTION ALTERNATIVES

This section describes the interim action alternatives considered and provides an explanation as to why the proposed alternative was selected, in accordance with WAC 173-340-430(7)(b)(ii). Alternatives that were considered included:

- No action – this alternative was considered as a baseline alternative and was not selected because, if no action were taken the PCBs present in PMC sediment could be mobilized during future storm events and redistributed downstream

- Capping of impacted sediment – capping alternatives were considered, but were not considered implementable because of the erosion that occurs during high stormwater flow at the headwaters of PMC and the desire to maintain a natural environment in the stream channel

- In-situ treatment – technologies for adequate in-situ treatment of PCBs in freshwater sediment in a dynamic creek channel are not available

- Physical removal – physical removal, by excavation or vacuum removal, was selected at the interim action alternative based on the physical characteristics of the creek and the relatively small volume of sediment to be removed

3.6 SELECTION OF SEDIMENT REMOVAL LIMITS

This section briefly documents how decisions were made regarding the lateral and vertical limits of sediment removal.

The lateral limits of sediment removal were selected based on the physical configuration of PMC in this reach. The creek is bounded by steep banks and bedload sediment is present within the clearly defined channel formed by these steep banks. Based on this configuration, the design requires removal of sediment across the entire width of PMC, from one steep bank to the other.

The reach of creek for sediment removal was selected based on the recent PCB concentration data from sampling stations throughout the creek and the downstream extent of ephemeral flow in the creek. As discussed in Section 3.4.1, the highest concentrations of Aroclor 1254 have been reported from sediments collected between PMG3B, which is located approximately 35 feet downstream of the detention basin spillway outlet, to PMG20 located approximately 200 feet downstream of the detention basin spillway outlet. Historic highs of PCB concentration in this reach have been in the range of several thousand micrograms per liter (1,100 µg/L to 6,900 µg/L over 4 sediment sampling stations). The results from the most recent sampling events in 2005 show a substantial decrease in PCB concentrations throughout this reach, however the most concentrated mass of PCBs remains in this reach of creek. The 120 ft-long reach of creek selected for this interim action encompasses the entire reach of creek where PCBs have historically been measured in the range of several thousand micrograms per liter, except for station PMG20. The results from the most recent sampling events in 2005 consistently show a substantial decrease in PCB concentrations at PMG20 (to between 51 µg/L and 140 µg/L from a historic high of 3,700 µg/L). These relatively low PCB concentrations at PMG20 do not warrant extending the reach selected for the IA to this sampling station, which is located within a reach of the creek with perennial flow.

The vertical limits of sediment removal were selected based on the results of the vertical profile sampling discussed in Sections 3.2.3 and 3.4.1. The significant attenuation of PCB concentration with depth implies that most of the PCB mass is present in the upper 12 inches of sediment. The design, however, does not state to simply, "Remove the upper 12 inches of sediment." This is because PMC in this reach exhibits small-scale topography, including the "island" present immediately downstream of the stilling basin, and because large riprap boulders are present in the bed of PMC in this reach. The design therefore clarifies that a minimum of 12 inches of sediment should be removed where sediment is present, and that sediment should be removed from beneath and around riprap boulders to achieve an approximate 12-inch removal depth from the average current grade across the creek at a location. The design anticipates that some riprap boulders will have to be moved to allow access to sediment, and that high pressure wash water and/or vacuum removal will be required to remove some sediment from between boulders. The design also anticipates that the engineer may direct specific sediment removal depths and techniques at some areas based on judgment in the field.

3.7 APPROACH FOR SEDIMENT REMOVAL AND HANDLING

This section briefly documents how decisions were made regarding sediment removal and handling, including:

- Access to the creek
- Collection of sediment and removal from the creek
- Laydown and staging areas

PMC in the reach selected for this IA is heavily vegetated with steep banks not readily accessible to construction equipment. To minimize the clearing and grading (and subsequent restoration) necessary for access to the creek, this design specifies cutting one limited access road to the work area from the western bank. The road is to be located near the upstream end of the work area and will provide access from the relatively level open area between the spillway and the peat filters. This access road is planned for use by small construction equipment and foot traffic.

PMC in the reach selected for this IA is relatively narrow, and the volume of sediment to be removed is relatively small (on the order of 200 cubic yards). The sediment to be removed is located, in some areas, around large riprap boulders and the roots of plants. Based on these facts, the design allows for multiple tools to be used to remove sediment containing PCBs. These tools include bulldozer or backhoe equipment sized to push small quantities of sediment into piles and also move large boulders and root balls. Also included are tools to remove loose sediment from on and around riprap boulders, such as a high pressure water wash, hand tools, and a vacuum truck. This approach anticipates that some loose sediment can be pushed into piles near the access road. Some sediment will be accessed by moving loose riprap boulders. Other sediment will be washed from boulders or jetted and vacuumed from between embedded boulders.

The areas available for access and staging near the work area are relatively small and are located near sensitive receptors including the created wetland and PMC itself. The sediment removed

from the creek is also expected to require dewatering prior to offsite disposal. Based on these facts, the design calls for sediment to be contained in roll-off containers equipped with drainage nets. The roll-off units can be filled using the staging area at the head of PMG between the spillway and the peat filter, and then moved out of PMG to an upland laydown area equipped with secondary containment.

3.8 RATIONALE FOR STORM CONTINGENCY PLAN

Work in the creek is expected to require less than three weeks to complete and is scheduled to be conducted during the dry season. It is possible that no storm events will occur during the period of construction. However, even small storm events can result, under normal operation, in flow from the stormwater detention basin outlet to the project reach of PMC. The design includes a contingency plan describing actions to be taken in the event of measurable precipitation during construction.

The contingency plan assumes that the most deleterious effects of flow in the project reach during construction would be realized if flow occurred at a time when contaminated sediments had been disturbed but were still present in the creek. Under these conditions, the contaminated sediment could be most easily mobilized downstream. The contingency plan also assumes that the next most deleterious effects of a storm event during construction would be the transport of turbid water downstream from the work area.

To protect the health and safety of workers in the creek, and protect the creek from the deleterious effects of potential storm events, the contingency plan includes the following:

- Careful scheduling of the work to take advantage of dry weather
- Expediting the contaminated sediment removal to minimize the length of time that disturbed contaminated sediment is present in the creek and vulnerable to sudden flows
- Advance draining of the stormwater detention basin to maximize its holding capacity and thereby maximize the response time for workers in the creek
- Closure, lockout, and tagout of the stormwater detention basin discharge valve to maximize the water retained in the stormwater detention basin and thereby maximize the response time for workers in the creek
- Visual monitoring of the water level in the detention basin to allow opening of the discharge valve when necessary to prevent overflow of the detention basin via the spillway.

- Staging of rolled geotextile that can cover the work area in the creek and can be quickly anchored to provide some protection to the exposed creek bottom during sudden flow
- Orderly evacuation of workers, materials, and equipment from the creek
- Placement of a sandbag decant weir at the downstream end of the work area, to slow any unexpected flow and allow for some solids settling.

3.9 RATIONALE FOR CHARACTERIZATION, TREATMENT, AND DISPOSAL

3.9.1 Sediment Characterization, Dewatering, and Disposal

Sampling and analysis of PMC sediments since 1998 has shown that the sediments not only contain PCBs, which are the contaminant of interest for this IA, but also low concentrations (typically not exceeding or only slightly exceeding regulatory cleanup standards) of metals and PAHs. Characterization of excavated sediment for disposal will include the following analyses:

- PCBs
- PAHs
- Total Metals (copper, nickel, and zinc)
- TCLP RCRA Metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver)
- TCLP organic compounds (TCE, tetrachloroethene, vinyl chloride)
- Total Solids

Disposal under Boeing's waste management program will also require that the sediment be thoroughly dewatered prior to transport off site. Several methods were considered for dewatering of excavated material, including construction of a sediment dewatering pad and dewatering within roll-off units. Roll-off unit dewatering was selected because:

- There is limited open, level land area near the work area in which to construct a sediment dewatering pad
- Roll-off unit dewatering is being successfully used to dewater Flightline solids and the approach can be easily adapted to the PMC sediment
- The water content of the sediment should be low, because of the plan to work during the dry season and granular nature of the sediment and the tendency for the

material to drain as it is removed from the creek (this drained water will be captured within the creek), making dewatering in roll-off units practical

Boeing has an active program at the Everett facility for handling and disposing of both water and solids containing PCBs (including a vacuum truck dedicated to handling water containing PCBs). This design makes use of this program by requiring the contractor to stage the sediment in roll-off units equipped with drainage nets, within an area of secondary containment. The existing Boeing program for water and solids handling will then be used to properly dispose of the material. Water from the roll-offs will be transported by vacuum truck to the Flightline water treatment system at Stall 205.5 for treatment and discharge to the Everett POTW. The dewatered material in the roll-offs will then be shipped to Arlington, Oregon for disposal.

3.9.2 Water Characterization, Treatment, and Disposal

Water may be generated during construction from one or more of the following sources: drainage from the sediment being excavated, potential groundwater seepage into the excavation area, and small volumes of wash water used to dislodge sediment. This water will be contained within the work area and collected in a construction dewatering sump. The water will be pumped from the sump to a temporary storage tank prior to treatment and disposal. Note that water generated as a result of sediment dewatering in the roll-off units will be handled separately by Boeing, as discussed in Section 3.9.1.

Several options were considered for treatment and discharge of water generated during construction, which may contain PCBs and low concentrations of TCE, metals, and PAHs.

- The water could be trucked to the Boeing Flightline water treatment system at Stall 205.5, treated, and discharged to the Everett POTW
- The water could be treated to meet the Everett POTW standards and discharged to the sewer main that passes near the work area (or trucked to the Boeing wastewater treatment plant)
- The water could be treated to meet surface water standards and discharged to the peat filter system, which discharges to the created mixed wetland and then to PMC downstream of the work area

Treatment and discharge to the Everett POTW was selected for this IA for the following reasons:

- Ecology disallowed discharge to the peat filter system.
- Because of the uncertainty regarding groundwater inflows into the work area, there is uncertainty regarding the volume of water to be treated. The volume could potentially exceed the capacity of the current stall 205.5 system. Committing to trucking the water elsewhere at the Boeing facility could result in large unanticipated costs if the water volume is larger than expected. An on-site

treatment system can better handle large volumes of water (if encountered), and a sewer line connected to the Everett POTW is available at the project site.

The volume of dewatering water collected for treatment could vary significantly depending on the local groundwater levels at the time of excavation and the amount of precipitation immediately before or during the sediment removal and stream restoration.

For purposes of sizing the treatment system, it was assumed that the groundwater table is immediately below the streambed along the entire length of the excavation and that the permeability of the well graded sands and gravels in the streambed is $2x10^{-2}$ cm/sec (50 ft/day). The quantity of water collected was estimated by calculating the rate of groundwater influx to a 120 foot long trench drawing down the water table 1.5 feet. The quantity estimated using these parameters is about 50,000 gallons per day or about 35 gpm. Based on these estimates, it is recommended that dewatering treatment capacity be on the order of 50 gpm to allow for some contingency. Dewatering calculations used to estimate the treatment sizing are included in Appendix B.

Due to the wide variation in the potential groundwater conditions in the streambed, groundwater elevations in the project reach will be checked by the engineer immediately prior to the start of excavation, and the treatment sizing will be reevaluated based on those data.

The treatment standards for the water treatment system were provided by the Everett POTW and are included in Appendix A. The POTW does not have standards for some potential constituents of the water, including PCBs. Nevertheless, the design includes treatment to remove these constituents, and numerical treatment goals have been selected based on available standards. Maximum expected constituent concentrations and the selected treatment goal criteria are provided in Table 6.

3.10 RATIONALE FOR SAMPLING DURING CONSTRUCTION

The rationale for the type, location, and frequency of samples to be collected during construction is written in to the sampling plan included as Section 5.0. Overall, sampling was selected to document protection of the environment during construction, characterize waste material for disposal (see also Section 3.9), and confirm the adequacy of the IA.

3.11 DESIGN PROCESS FOR STREAM RESTORATION

The general approach for the stream restoration design includes three steps: a) examine the existing condition of the stream to evaluate its equilibrium configuration and identify potential critical areas; b) develop a replacement channel design (post-sediment removal) that has equivalent function while considering several design concerns; and c) evaluate the hydraulic performance of the proposed design.

Existing Conditions

Using the one-foot contour data developed by Reid Middleton in the February 2006 survey, 26 cross sections of the stream channel were extracted. The data referenced span the distance from the stilling basin inlet to approximately 280 feet downstream, which is about 100 feet downstream of the "wood weir" (Figure 7).

These data were entered into a HEC-RAS model (USACE, 2002) to determine critical areas in the current stream as defined by flow depth, velocity, and streambed slope. This analysis also defined the existing "equilibrium" channel slope, or the slope the channel has attained under current flow conditions. The analysis recognized that the channel has been influenced by the placement of riprap and the wood weir.

The existing channel slope ranges from 1 to 15 percent with an overall slope of 4 percent in the project area. Downstream of the project the channel bed averages 3 percent. Velocities range from 1 to 7 feet per second (fps) with a reach average of 4 fps. The flow is supercritical, as defined by the Froude number, in the two areas where the slope is greatest. One of these areas is where the riprap stabilization ends and there is an abrupt drop in the channel elevation. The other area is about 20 feet upstream of the wood weir and may be a migrating head cut or another channel grade adjustment in reaction to the installation of the west bank cribbing (see Section 3.3.1).

Future Conditions

A future channel shape was defined using the Manning equation for open channel flow. The proposed channel has a low flow sub-channel in a 50 cfs capacity main-flow channel plus an additional one foot of freeboard. Because of the narrow "valley" widths in the project reach (minimum is about 15 feet) steep side slopes on the stream channel were required. The low flow channel is one foot deep and has 2:1 (H:V) sides; the main flow (plus freeboard) channel is 2 feet deep with side slopes of 3:1 (H:V).

In addition to the narrow stream valley width, there were several other design considerations that affected the channel configuration. In order to minimize costs associated with material testing, acquisition, and disposal, as well as limiting construction dewatering, additional excavation for restoration in the channel beyond that necessary for the sediment removal was minimized. Additionally the design considered the assumed presence of embedded riprap beneath the proposed new channel in the area where riprap had historically been placed (upstream end). Excavation into this riprap for channel construction or log anchoring would be prohibitively difficult. Finally, it was desirable to reduce the channel slope to 3 percent to match that of the downstream reach.

The proposed channel was modeled in HEC-RAS to evaluate the impact of streambed slope and instream roughness. The moderately high slope and narrow channel requires a substantial amount of in-channel roughening to reduce velocities and limit super-critical flow formation.

Considering the design/construction concerns and the physical requirements associated with the channel elevation changes, the proposed configuration will have no interim bed stabilization, such as rock sills or boulder weirs, which require up to 5 feet of excavation below the stream channel invert elevation. Instead, a channel will be constructed from the stilling basin outlet to a location about 20 feet upstream of the project end. At the end of the channel, a boulder cascade will provide a stabilized form that drops the water about three feet in elevation to match the existing streambed elevation. The end of the boulder cascade will have to have subgrade hardening to prevent scour from destabilizing the streambed and boulder cascade.

Channel roughness will be provided by anchored rootwads and embedded boulders downstream of the riprap area. Near the channel 'head' (the stilling basin outlet) the underlying riprap precludes the anchoring of rootwads or other timber. Therefore the channel will be defined and roughened with large diameter boulders only. In this area, the upper (eastern) bank will be planted with native vegetation as described in Section 3.12.

A secondary design consideration was the scenario wherein flows were released from the detention pond via the spillway. This could happen if the discharge structure were blocked or damaged or if the volume of inflow to the detention pond exceeded its capacity. Assuming that flows would come over the stilling basin wall, an additional 'layer' of roughness was added across the valley as a whole to both slow down the flow rate and direct it toward the constructed stream channel. In addition, several boulders on the far east side of the valley were added to direct the local streamflows that generate from the adjacent hillside and flow along the east side of the stilling basin before entering the channel area.

The generalized stream restoration plan is provided in Figure 7.

Design Evaluation

The proposed channel configuration was designed and evaluated to meet the following conditions and parameters:

- Channel bed particle sizing – resistance to flow (channel roughness) and velocity of incipient motion from design flow
- Boulder sizing – resistance to flow (channel roughness) and velocity of incipient motion from spillway release
- Boulder cascade material sizing – Froude number and resistance to scour
- Channel bed subgrade – check for filter material necessity and sizing (distribution)
- Scour estimate for vertical channel stability – in channel bed and at end of boulder cascade

- Stream hydraulic continuity maintenance – plug log placement
- Anchoring of large woody debris – ballast sizing

The resultant materials are show in the design plans. Complete details of the analyses performed in support of the restoration design are contained in Appendix B.

3.12 REVEGETATION DESIGN

The existing site conditions are described in Subsection 3.3.4. During a site visit on December 6, 2005, woody plant species were observed within the area to be disturbed; these are listed in Table 7.

Revegetation design goals are to provide shade for the stream; provide a source of leaf mulch, which becomes a nutrient source within the stream; provide some additional, but limited bank stabilization; replace existing plant species with same, with the exception of non-natives, or plant other species that will survive in the projected conditions.

Design concerns to be addressed are:

- Minimal post-construction watering or maintenance beyond standard 1-year contractor warranty
- Address the substantive requirements established by the Washington Department of Fish and Wildlife in their letter of December 7, 2005.
- Specify plantings that will survive in existing riprap medium

Four different planting zones were identified based on expected post-site construction conditions. These zones and their proposed species are as follows.

- Area currently vegetated by trees to be cleared for site access: Douglas fir, big-leaf maple, and red alder, planted 9 feet on center.
- Area currently vegetated by herbaceous species to be cleared for site access: Place rolled erosion control mats and hydroseed.
- Area with existing riprap to be cleared for site access: Scouler willow, placed opportunistically amongst riprap, depending on soil conditions. Approximate spacing will be 3 feet on center.

- Area east of stream, just downstream of stilling basin, expected to be embedded riprap after sediment removal: Western red cedar (planted 9 feet on center) and salmonberry (clusters of 3 shrubs, planted 9 feet on center).

- Areas along narrow floodplain of newly constructed channel: Scouler willow, placed opportunistically depending on soil conditions. Approximate spacing will be 3 feet on center.

- All planting zones will be protected with rolled erosion control mat and hydroseeded.

The constructed stream channel is not proposed for plantings. The channel materials will consist of gravels, cobbles, boulders, and riprap. No soil medium is planned, because it will likely wash away. Plant survival in areas without soil is limited, so will have no benefit.

4.0 SITE MANAGEMENT

4.1 HEALTH AND SAFETY

All field work performed for this interim action will be in accordance with the site-specific health and safety plan (HASP) prepared for URS employees working at the Boeing Everett site. Health and safety for URS employees is also addressed by the URS corporate health and safety program. The HASP for the Boeing Everett site specifically addresses construction and sampling activities in PMG.

Subcontractors to URS who perform intrusive work at the site will be required to prepare their own site-specific HASP in accordance with current Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Administration (WISHA) regulations, as well as Boeing facility-specific requirements. Site-specific health and safety plans will not be required for contractors performing nonintrusive, aboveground work, including surveying and delivery of materials. Such contractors will be required to adhere to safe work standards of practice for their respective industries. All contractors (except those only delivering materials to the staging area) will be provided with a copy of URS' site-specific HASP for reference.

4.2 PERMITTING

As discussed in Section 3.1, this IA must comply with the substantive requirements of state and local regulations, however state and local permits need not be obtained. The IA is not exempt from fully complying with federal regulations and obtaining permits from federal agencies. Only one federal permit is required for this IA – a USACE CWA Section 404 Nationwide Permit No. 38, which was issued for this proposed IA by USACE on February 8, 2006.

The substantive requirements for potential ARARs have been identified through the work plan and design process, in consultation with the regulating agencies. The substantive requirements of each ARAR are discussed in detail in Section 3.1.

The design specifications require the contractor to notify the engineer and owner if additional permit requirements, not identified in Section 3.1, are potentially applicable to this action. The specifications also make clear that licenses, bonding, health and safety regulations, and other requirements necessary for the contractor to perform construction work at any site, are not waived by the regulatory status of this IA.

4.3 ACCESS AND STAGING

Access to the work area will be along the PMG access road from North Perimeter Road at the north end of the Boeing Everett facility. Although a bar gate is located at this entrance, it is typically not locked and therefore should not restrict access during construction. Roving Boeing

security patrols periodically inspect PMG, and contractor personnel will therefore be required to obtain contractor badges. Temporary personnel such as delivery drivers need not obtain badges as long as badged personnel escort them while on site. Contractor personnel are not expected to need access to the security-controlled, fenced portions of the Boeing Everett facility.

All but one of the staging areas will be located within PMG. A creekside staging area will be established at the head of PMC, near the detention basin spillway and the toe of detention basin level. Access to PMC will be constructed from this creekside staging area, and sediment will be loaded into roll-off units within this staging area. Because this area is not large, filled roll-off units will be temporarily stored in a separate excavated material storage area, located in the parking lot directly across North Perimeter Road from PMG. The excavated material storage area will be bermed and lined for secondary containment. Supplemental staging areas will be established within PMG in the area of the stormwater detention basin and will be used to stage water treatment equipment, import material stockpiles, and support vehicles and equipment as necessary.

4.4 SAFE WORK AROUND EXISTING UTILITIES

Underground utilities in the work area will be identified and marked using the following procedures:

- Notification to local utilities through the "one-call" telephone service at least 48 hours in advance of intrusive field activities
- Review of existing plans showing the locations of underground utilities

Excavation activities around known, marked underground utilities will be conducted using standard of practice safety precautions. All excavation will be performed with consideration that unknown, unmarked underground utilities may be present and will use safe work practices to identify and avoid such utilities whenever possible.

4.5 TRAFFIC CONTROL

Construction work for this interim action will be conducted off of public roadways on Boeing property. The access road into PMG from North Perimeter Road is used infrequently by Boeing facilities personnel and Boeing contractors. The temporary storage area for excavated sediment will be located across North Perimeter Road from the work area in PMG. Only minimal traffic control, consisting of intermittent use of flaggers to cross North Perimeter Road and barricades to reserve a haul route through the parking lot, is expected to be necessary.

4.6 ENVIRONMENTAL PROTECTION AND HOUSEKEEPING

Best management practices will be used to protect the environment during construction and maintain a neat, clean, and safe work site. The work area will be limited to only that necessary to

complete construction. The nearby wetlands and peat filter system will be marked and protected during the work. Stormwater flow over staging areas will be controlled and filtered by perimeter silt fencing and straw mulch, as needed. Mobile fueling of equipment will be conducted with secondary containment in place to prevent releases. A stabilized construction entrance will be provided at the location where construction equipment enters paved roadways, and roadway cleanup will be performed as needed. Secondary containment will be provided at the storage area for contaminated sediment.

A contingency plan will be implemented to mitigate the potential deleterious effects of an unexpected storm event during construction. A sandbag decant weir and sump will be constructed at the downstream end of the work area to slow sudden storm flows in the project reach and allow settling of sediment. The decant weir will be left in place until after the first flush following completion of construction.

4.7 INTERIM ACTION CONSTRUCTION WORKFLOW

The primary work under this interim action is expected to be completed within the timeframe August 1, 2006 to September 30, 2006. Follow-on work is expected to continue through November 2007. The proposed sequence of work is:

1. Pre-construction badging and submittals
2. Mobilization of personnel, equipment, materials, and supplies
3. Site preparation, including temporary erosion and sediment control measures including staging of fabric
4. Construct secondary containment at Excavated Material Temporary Storage Area
5. Install Temporary Construction Dewatering Water Storage, Treatment, and Discharge System
6. Prepare roll-off units with drainage nets
7. Install decant weir
8. Install additional required erosion and sediment control
9. Clear access to creek bed
10. Prepare access road to creek bed
11. Install rolled erosion control product and hydroseed access road slopes
12. Clear creek bed

13. Cut and remove vegetation in creek bed

14. Remove, contain in roll-off units, and store contaminated sediment, moving and washing loose riprap as required and controlling water as necessary

15. Await confirmation sampling and approval to restore creek by Engineer

16. Place large woody debris, large rock, and other restoration materials in creek bed

17. Place rolled erosion control product and hydroseed portions of creek bed

18. Cleanup and demobilize staging and remaining work areas

19. Return to site and perform planting, remove decant weir, and remove and restore area of secondary containment

20. Maintain plantings for 12 months

4.8 RECORD DOCUMENTATION

The completed construction will be documented in an Interim Action Completion Report. This report will include record drawings based on a land survey of the restored creek configuration, a narrative describing the interim action performed and results of sampling during construction, documentation of waste disposition, and plans for post-interim action monitoring.

4.9 INVESTIGATION-DERIVED WASTE SAMPLING AND DISPOSITION

Waste streams generated during construction will include the following:

1. Construction debris, such as uncontaminated plant material from clearing and grubbing

2. Sediment excavated from PMC

3. Water collected from sediment dewatering in roll-off units

4. Incidental water collected in the secondary containment surrounding the roll-off units

5. Water pumped from the excavation area in PMC

6. Decontamination water from sampling activities during construction

These waste streams will be handled as follows:

1. Construction debris will be disposed of by the contractor in accordance with Federal, State, and Local requirements, with no sampling required

2. Sediment will be sampled as it is loaded into the roll-off units, characterized for disposal, and disposed of by Boeing under the existing waste management program

3. Water collected from sediment dewatering in roll-off units will be collected and transported by Boeing to the Stall 205 treatment system, treated, and discharged to the Everett POTW under the existing Boeing waste management program

4. Incidental water collected in the secondary containment area will be collected, treated, and discharged to the Everett POTW by the contractor during construction and by Boeing after contractor demobilization but before final sediment dewatering and removal of the secondary containment

5. Water pumped from the excavation area in PMC will be collected and treated by the contractor, sampled in batches, and discharged (when approved) to the Everett POTW

6. Decontamination water generated during sampling activities will be handled by Boeing using standard procedures for decontamination water

4.10 POST-CONSTRUCTION NOTIFICATIONS AND MONITORING

Within 7 calendar days of completion of restoration and planting, the Project Engineer or his designee will notify the Area Habitat Biologist at *holsegh@dfw.wa.gov* and request a compliance inspection.

Boeing will own, operate, and maintain the cleanup action following acceptance of completed construction. The installation contractor will be required to warranty and maintain the revegetated areas for a period of 1 year. Boeing, or a separate contractor to Boeing, will maintain the revegetated areas for an additional 2 years in accordance with the substantive requirements of the Washington Department of Fish and Wildlife (see Section 3.1.2).

Post construction monitoring will be specified in detail in the Interim Action Completion report, but will generally consist of maintaining the health of plants installed during restoration and documenting significant changes in stream configuration resulting from natural processes in the three years after construction is complete. Monitoring will also include sampling and analysis of loose sediment if significant quantities accumulate in the first three years following construction.

4.11 PUBLIC PARTICIPATION

Public notice of this IA is required by WAC 173-340-600(16), and will be combined with public notice of the Agreed Order amendment requiring this IA, as allowed for under WAC 173-340-600(16). Public notice, through newspaper advertising and direct mail to local residents and

property owners, will be directed by Ecology, with the support of Boeing. A 30-day comment period will be established following the public notice, during which time the public will be encouraged to provide input. Revisions will be made to the IA design based on the public input.

5.0 SAMPLING AND ANALYSIS DURING CONSTRUCTION

5.1 SAMPLING AND ANALYSIS PLAN

Five categories of samples will be collected and analyzed during construction of this IA:

- Sediment disposal characterization samples
- Water discharge characterization samples
- Surface water monitoring during construction
- Creek bed confirmation samples
- Import material samples

The media and analysis requirements are summarized in Table 8. Sample containers, preservatives, and holding times for each media and analytical method are summarized in Tables 9 and 10.

Sampling of some, but not all, import material will be required under this design. Import materials that will be sampled will be general stream backfill, which will consist of a well-graded sand and gravel, and topsoil.

The import material that will not be sampled will consist of large boulders, river rock, and filter gravel, which is a minimum size of 1/4 inch. It is not practical to sample this material for contaminants, and contaminants would be unlikely to adhere to cobbles and rock of this size. The design requires that this material be from a virgin source, to minimize the potential for contamination.

5.1.1 Sediment Disposal Characterization Sampling

This subsection describes methods and procedures to be used in sampling sediment removed from PMC. The purpose of this sampling is to characterize the sediment for disposal.

Sampling Methods and Sample Handling

Sediment will be removed from PMC through excavation or vacuum removal and deposited into roll-off boxes for dewatering. One composite sample representative of the contents of each roll-off box will be collected and submitted for analysis. Each composite sample will consist of a minimum of 3 discrete samples collected during transfer of sediment to the roll-off box or collected directly from the roll-off box. The discrete samples will be collected using a clean, stainless steel spoon, hand auger, scoop, or shovel or a new, disposable plastic spoon or scoop. The discrete samples will be transferred to a clean stainless steel bowl and mixed. Free water will be grossly decanted from the composite sample, to mimic the dewatering process that will occur in the roll-off boxes, by withholding the sediment using the spoon and allowing the free water to drain into the roll-off box. The composite sediment samples will be visually examined for evidence of dangerous constituents and classified in accordance with the Unified Soil

Classification System (USCS, ASTM D 2487-93). The sample will then be transferred from the mixing bowl into clean soil sample containers provided by the laboratory (Table 9).

All samples will be packed and stored in a pre-cooled cooler with ice or an ice substitute to maintain temperatures at 4 ± 2 degrees Celsius until samples are transferred to the laboratory. Samples will be transferred to the analytical laboratory within 72-hours of collection.

Analytical methods and data turn-around

Sediment disposal characterization samples will be analyzed for PCBs, PAHs, total metals (copper, nickel, and zinc), and TCLP RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver) and TCLP organics (TCE, tetrachloroethene, and vinyl chloride) as summarized in Table 9.

The sampler will specify on the chain of custody (COC) form that the data turn-around is 2 weeks and laboratory reports should be sent to URS for review and validation. Copies of the COC and laboratory analytical reports will be submitted to Boeing and Ecology in the completion report for the interim action.

Sample Labeling

Sample containers will be labeled before the samples are collected. The samples will be labeled with the sample type, roll-off box number, and the date with the following format: SEDDIS-ROBx-yymmdd. For example, if the first and second roll-off boxes are loaded on March 7, 2006, the respective composite samples will be labeled SEDDIS-ROB1-060307 and SEDDIS-ROB2-060307. If the third roll-off box is loaded on March 8, 2006, the sample will be labeled SEDDIS-ROB3-060308. Field duplicates will be labeled with the sample type, duplicate number, and the date with the following format: SEDDIS-ROBDUPx-yymmdd. Duplicates will be numbered consecutively starting with 1. Equipment blanks, if collected, will be labeled with the sample type, equipment blank number (numbered consecutively starting with 1), and the date with the following format: SEDDIS-EBx-yymmdd.

Equipment Decontamination

All sample collection equipment that is not dedicated or disposable will be decontaminated between each sampling location in the following manner:

- Surfactant (Alconox or equivalent) and tap water wash
- Tap water rinse
- Distilled-deionized water rinse
- Air dry

Disposable equipment (e.g., bailers, nitrile gloves, etc.) will be used once and placed in a plastic garbage bag for proper disposal.

Water generated by decontamination procedures will be properly contained in labeled 55-gallon drums or other containers. Characterization and disposal of the waste will be completed by Boeing.

5.1.2 Water Discharge Characterization Sampling

This subsection describes methods and procedures to be used in sampling water generated by construction dewatering. The purpose of this sampling is to document that the water has been properly treated prior to discharge. This section does not cover sampling of water generated by dewatering of PMC sediments. Water released by the sediments will be collected by Boeing and treated using the Flightline water treatment system already in place. Documentation of proper treatment and discharge of water will use the sampling procedures and requirements established for that system.

Sampling Rationale, Frequency, and Methods

Samples will be collected of the water removed from the excavation during construction periodically prior to treatment, and on a batch basis after treatment but prior to discharge to the POTW. Each batch of treated water will be held (i.e., not discharged) until sampling demonstrates that the batch meets the discharge criteria. The purpose of sampling the pre-treated water is to help assess the performance of the treatment system, and to provide general data on the concentrations of contaminants in the very shallow groundwater. These general data may be used for other actions at the site.

Samples will be collected from the treatment system influent once during the first 4 hours of operation and daily thereafter for the duration of water treatment. Samples will be collected by filling the sampling containers directly from the influent sampling port on the treatment system.

One sample will be collected from each batch of water prior to discharge. Samples will be collected from the water stored in the treated water tank with a disposable bailer or other appropriate sampling device and the water will be transferred to sample containers provided by the laboratory (Table 10). All samples will be packed and stored in a pre-cooled cooler with ice or an ice substitute to maintain temperatures at 4 ± 2 degrees Celsius until samples are transferred to the laboratory. Samples will be transferred to the analytical laboratory on the day collected or the morning following collection.

Analytical methods and data turn-around

Water discharge characterization samples will be analyzed for total metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc), PCBs, TCE, PAHs, closed-cup flash point, and pH. With the exception of PCBs, TCE, and PAHs, these constituents are required analyses for authorization to discharge to the City of Everett POTW. PCBs, volatile organic compounds, metals, and PAHs are known potential contaminants that may be present in the untreated or treated water.

The sampler will specify on the chain of custody (COC) form that the sample results should be provided on a **24-hour turn-around** and that laboratory reports should be sent to URS for review and validation. Copies of the COC and laboratory analytical reports will be submitted to Boeing and Ecology in the completion report for the interim action.

Sample Labeling

Sample containers will be labeled before the samples are collected. The treatment influent samples will be labeled with the sample type, chronological number, and the date with the following format: WATINFx-yymmdd. The discharge batch samples will be labeled with the sample type, water batch number, and the date with the following format: WATDIS-BATx-yymmdd. Field duplicates will be labeled with the sample type, duplicate number, and the date with the following format: WATDIS-BATDUPx-yymmdd. Equipment blanks, if collected, will be labeled with the sample type, equipment blank number (numbered consecutively starting with 1), and the date with the following format: WATDIS-EBx-yymmdd.

Equipment Decontamination

All sample collection equipment that is not dedicated or disposable will be decontaminated between each sampling location in the following manner:

- Surfactant (Alconox or equivalent) and tap water wash
- Tap water rinse
- Distilled-deionized water rinse
- Air dry

Disposable equipment (e.g., bailers, nitrile gloves, etc.) will be used once and placed in a plastic garbage bag for proper disposal.

Water generated by decontamination procedures will be properly contained in labeled 55-gallon drums or containers. Characterization and disposal of the waste will be completed by Boeing.

5.1.3 Surface Water Monitoring During Construction

Surface water in PMC will be monitored periodically during construction to document that construction activities are not negatively impacting water quality downstream of the work area. A surface water monitoring station will be established approximately 100 feet downstream of the downstream end of the work area. The turbidity in surface water at this location will be measured with a field turbidity meter 3 times prior to construction and 3 times per day during construction. The criterion for a negative impact to surface water will be that the turbidity during construction (as measured by any single result) shall not exceed the mean of the pre-construction turbidity measurements by more than 5 NTU when the pre-construction measurement was 50 NTU or less, or exhibit more than a 10 percent increase if the pre-construction measurement was more than 50 NTU.

5.1.4 Creek Bed Confirmation Sampling

This subsection describes methods and procedures to be used in sampling the creek bed after sediment is removed from PMC, and to evaluate the data. The purpose of this sampling is to confirm that sediments with the highest concentrations of PCBs have been removed and to document the remaining concentrations of PCBs, metals, and PAHs (if any) in the creek bed.

For the purposes of decision making during construction, the PCB concentrations in the confirmation samples will be compared to the pre-design sample data to evaluate whether a sufficient mass of PCBs has been removed. The expectation is that the specified depth of sediment removal (12 inches) will leave behind PCB concentrations at the same order of magnitude as those concentrations found in 12 inch to 24 inch samples during pre-design sampling. Therefore, confirmation sample results for PCBs in the concentration range of "not detected" to approximately 100 µg/kg will be interpreted to mean that a sufficient mass has been removed. However, because this is a qualitative comparison standard, one or a few results exceeding 100 µg/kg will not necessary result in additional sediment removal. The actual data will be compared to the pre-design data by Boeing and Ecology and a real-time agreement will be reached as to whether additional sediment removal is warranted.

Sample Locations and Sampling Methods

Sediment samples will be collected at four to six sampling locations established in the 120-foot-long removal area. One station will be located at each end of the work area (one just beyond the stilling basin and one at the downstream end of the removal area). Four samples will be collected between these two samples from areas where sediment is exposed such that the samples provide a spatial representation of the area excavated. The location of each sample across the width of the stream will be selected by the field staff based on judgment regarding where sediment might have been most likely to accumulate. For instance, if a sampling location is in an area of riprap, the sample will be collected from the interstitial material between riprap boulders in a low area if material is available to sample.

Sediment samples will be collected from the upper 6 inches of material at each location using either a clean, stainless steel spoon or scoop, or a new, disposable plastic spoon or scoop. Sediment samples will be visually examined for evidence of hazardous substances and classified in accordance with USCS (ASTM D 2487-93), if applicable. The samples will be transferred directly to laboratory-provided containers (Table 9). All samples will be packed and stored in a pre-cooled cooler with ice or an ice substitute to maintain temperatures at 4 ± 2 degrees Celsius until samples are transferred to the laboratory. Samples will be transferred to the analytical laboratory on the day collected or the morning following collection.

Analytical methods and data turn-around

Sediment samples for confirmation of PCB removal will be analyzed for PCBs, total organic carbon, total solids, total metals (barium, chromium, copper, lead, and zinc), and PAHs.

The sampler will specify on the chain of custody (COC) form that the sample results should be provided on a **24-hour turn-around** and that laboratory reports should be sent to URS for review and validation. Copies of the COC and laboratory analytical reports will be submitted to Boeing and Ecology upon completion of data validation so that a real-time decision can be made regarding the effectiveness of the removal action.

Sample Labeling

Sample containers will be labeled before the samples are collected. The samples will be labeled with the sample type, location number, and the date with the following format: SEDCONx-yymmdd. These sample locations will not be permanent locations thus the sampling scheme does not continue with the PMG designation and consecutive numbering that is in use for other monitoring on PMC. Field duplicates will be labeled with the sample type, duplicate number, sampling depth in feet bgs, and the date with the following format: SEDCONx-DUPx-yymmdd. Equipment blanks, if collected, will be labeled with the sample type, equipment blank number, and the date with the following format: SED-CONEBx-yymmdd.

Equipment Decontamination

All sample collection equipment that is not dedicated or disposable will be decontaminated between each sampling location in the following manner:

- Surfactant (Alconox or equivalent) and tap water wash
- Tap water rinse
- Distilled-deionized water rinse
- Air dry

Disposable equipment (e.g., bailers, nitrile gloves, etc.) will be used once and placed in a plastic garbage bag for proper disposal.

Water generated by decontamination procedures will be properly contained in labeled 55-gallon drums or containers. Characterization and disposal of the waste will be completed by Boeing.

5.1.5 Import Material Sampling

This subsection describes methods and procedures to be used in sampling the general stream bed backfill material and the topsoil imported to the site. The purpose of this sampling is to confirm that the import materials are not sources of PCBs, metals, or PAHs. The construction contractor will be required to submit the name and location of the sources of these import materials, and URS personnel will visit the sources to collect samples.

Sample Locations and Sampling Methods

Soil samples will be collected at three discrete locations from the source stockpile of each material type (2 material types). One composite sample of each material type will be created from the discrete samples.

The discrete samples will be collected using a clean, stainless steel spoon, hand auger, scoop, or shovel or a new, disposable plastic spoon or scoop. The discrete samples will be transferred to a clean stainless steel bowl and mixed. The composite sediment samples will be visually examined for evidence of dangerous constituents and classified in accordance with the Unified Soil Classification System (USCS, ASTM D 2487-93). The sample will then be transferred from the mixing bowl into clean soil sample containers provided by the laboratory (Table 9).

All samples will be packed and stored in a pre-cooled cooler with ice or an ice substitute to maintain temperatures at 4 ± 2 degrees Celsius until samples are transferred to the laboratory. Samples will be transferred to the analytical laboratory on the day collected or the morning following collection.

Analytical methods and data turn-around

Soil samples of import material will be analyzed for PCBs, total organic carbon, total solids, total metals (barium, chromium, copper, lead, and zinc), and PAHs.

The sampler will specify on the chain of custody (COC) form that the sample results should be provided on a **24-hour turn-around** and that laboratory reports should be sent to URS for review and validation. Copies of the COC and laboratory analytical reports will be submitted to Boeing and Ecology upon completion of data validation so that a real-time decision can be made regarding the suitability of the import material.

Sample Labeling

Sample containers will be labeled before the samples are collected. The samples will be labeled with the sample type, location number, and the date with the following format: SOILIMPx-yymmdd. Field duplicates will be labeled with the sample type, duplicate number, and the date with the following format: SOILIMPx-DUPx-yymmdd. Equipment blanks, if collected, will be labeled with the sample type, equipment blank number, and the date with the following format: SOILIMPEBx-yymmdd.

Equipment Decontamination

All sample collection equipment that is not dedicated or disposable will be decontaminated between each sampling location in the following manner:

- Surfactant (Alconox or equivalent) and tap water wash
- Tap water rinse

- Distilled-deionized water rinse
- Air dry

Disposable equipment (e.g., bailers, nitrile gloves, etc.) will be used once and placed in a plastic garbage bag for proper disposal.

Water generated by decontamination procedures will be properly contained in labeled 55-gallon drums or containers. Characterization and disposal of the waste will be completed by Boeing.

5.2 DOCUMENTATION

Sample Collection Form

Sample collection forms (Appendix C) will be completed by the sampler at the time each a sediment sample or water sample is collected. The form requires information on project and event identification, the sample number, information on sample location conditions, field parameters, and a description of the physical characteristics of the sediments/solids (color, grain size, staining, odor, etc). When the sampling event is complete, the final forms will be maintained in the project file by URS or Boeing.

Chain of Custody Form

The sample custody record will be maintained through the use of a COC form (Appendix C). The COC form will accompany each group of samples delivered to the laboratory. This form will contain all information recorded on the sample label. The sample will be listed on this form as soon as it is labeled.

The sampler will be responsible for the care and custody of the samples from the time they are collected until they are transferred to another individual. The sampler will complete the COC form for each sample shipment. When transferring custody, the individuals relinquishing and receiving samples will sign, date, and note the time of the exchange on the record. The custody record will be completed using waterproof ink. Corrections will be made by drawing a single line through the error and initialing and dating the correction. Information will not be erased or rendered unreadable. Separate COC forms will be used for samples from each area.

6.0 ANALYTICAL DATA QUALITY ASSURANCE PLAN

This Quality Assurance Project Plan (QAPP) describes quality assurance/quality control (QA/QC) procedures developed to ensure that data quality objectives are met. The QAPP (URS 2005a) is a separate document that should be reviewed by the sampling personnel prior to each sampling event. A summary of field QA procedures is presented in the following sections.

6.1 SAMPLE COLLECTION AND HANDLING

Sampling procedures are described in Section 5.0, Sampling and Analysis During Construction. When a permanent modification of an approved sampling protocol is necessary, the modification will be included in this document. Temporary modifications caused by non-typical field conditions or equipment malfunction shall be recorded on the appropriate sample collection form and the Boeing project manager shall be notified. Depending on the nature of the variation, a decision will be made whether to resample.

Sample containers, preservatives and holding times will be appropriate for the type of sample collected and the analytical method to be used (Tables 8 through 10). Maximum sample holding times will be strictly adhered to. Each sample will be documented, labeled and identified as noted in Section 5. Complete documentation of sample collection and handling shall be maintained by URS and Boeing.

Samples will be collected by URS personnel, and then submitted to Analytical Resources, Inc. for analysis. Review of the laboratory analytical results will be performed by URS and will follow the data quality objectives specified in the QAPP (URS, 2005a).

6.2 SAMPLE CUSTODY

A sample is under an individual's custody if one or more of the following criteria are met:

- it is in the sampler's possession
- it is in the sampler's view after being in possession
- it is in the sampler's possession and secured to prevent tampering
- it is in a designated secure area

In order to maximize sample integrity and accountability, strict chain-of-custody procedures will be adhered to.

6.2.1 Field Custody Procedures

A limited number of people will handle the samples. The sampler will be personally responsible for completion of the COC Form and the care and custody of collected samples until they are transferred to another person.

6.2.2 Transfer of Custody

When samples transfer possession, the individuals relinquishing and receiving the samples will sign the COC Form and document the date and time of transfer. The sample collector will sign the form in the first signature space. The sample receiver will then sign the form in the second signature space.

6.2.3 Laboratory Custody Procedures

A designated sample custodian in the laboratory will accept custody of the samples. The custodian will verify that the sample identification numbers match those on the chain-of-custody record. The laboratory will maintain sample security and custody as appropriate.

6.3 INTERNAL QUALITY CONTROL

Quality Control (QC) checks will consist of measurements performed in the field and laboratory. QC checks include analysis of a number of field and laboratory QC samples, as outlined in the QAPP. These samples will be evaluated to verify accuracy, comparability, completeness, and precision of analytical results for this sampling routine. The following field QC samples will be obtained and analyzed.

6.3.1 Equipment Blank

An equipment blank will be collected and analyzed only if non-disposable equipment is used. Equipment blanks will consist of distilled, deionized water (supplied by the analytical laboratory) passed over and/or through decontaminated sampling equipment. Surfaces and materials exposed during actual sampling will be rinsed to evaluate the effectiveness of sampling equipment decontamination procedures and potential for equipment or field cross contamination. Equipment blanks shall be collected at a rate of one per 20 samples collected per media (sediment characterization samples, water discharge characterization) or one per sampling event (sediment confirmation sampling) and analyzed for all parameters specified for the associated field samples.

6.3.2 Blind Field Duplicate

The field duplicate will consist of a split sample collected at a single sampling location. Samples will be coded such that the laboratory cannot identify which samples are duplicates from the information on the sample label. Field duplicates will be collected for sediment characterization, water discharge, and sediment confirmation samples at a rate of one per 20 samples collected. The samples will be analyzed for the same parameters as the parent sample (Table 8). Field duplicates will not be collected for water influent samples entering the treatment system. The identification of field duplicates will be recorded on the sample collection form for the parent sample.

7.0 CONSTRUCTION QUALITY ASSURANCE

7.1 DEFINITIONS

7.1.1 Quality Assurance and Quality Control

Construction Quality Assurance

Construction quality assurance (CQA) refers to the means and actions employed to ensure conformity of the IA construction with the IA design drawings and specifications. The CQA means and actions employed will provide confidence that items or services meet contractual and regulatory requirements and will perform satisfactorily in service. URS, as the prime contractor for the IA, will perform the CQA activities.

Construction Quality Control

Construction quality control (CQC) refers to those actions taken by manufacturers, fabricators, installers, and any subcontractors to measure or otherwise ensure that the materials and workmanship meet the requirements of the IA design drawings and specifications. CQC may be provided by the manufacturers, fabricators, and installers of the materials, but is the ultimate responsibility of URS.

Other Quality Assurance and Quality Control

Quality assurance and quality control (QA/QC) for nonconstruction tasks, such as sampling during construction, are described in the QAPP (Section 6.0).

7.1.2 Parties to CQA/CQC

This section defines the parties associated with the IA in their roles for CQA/CQC. Contacts for each party are listed in Section 1.0. In this document, the term "he" is used without reference to gender, and may refer to organizations as well as individuals.

Owner

The owner is Boeing Commercial Airplanes, which controls the contract under which the IA is to be performed.

Project Engineer

The project engineer is a professional engineer registered in the State of Washington responsible for observing and reviewing the construction for conformance to the IA design drawings and specifications. During construction the project engineer will furnish interpretations and clarifications as required and will be responsible for modifying or changing the design if unexpected site conditions arise. URS will provide the project engineer for this project. The

final acceptance punch list will be completed by the Boeing project manager and the project engineer.

CQA Officer/CQA Monitor

The CQA officer represents the owner and is responsible for supervising the day-to-day performance of CQA activities. The CQA officer will be responsible for observing and documenting activities associated with quality assurance for materials and installation during the IA construction activities. CQA duties for this project will be performed by the project engineer or his representative, referred to as the CQA monitor, and will be provided by URS.

Construction Contractor

The construction contractor is the firm responsible for performing the construction activities necessary for a complete and operating facility as shown in the design drawings. The construction contractor is responsible for CQC activities, including providing personnel and some laboratory testing services. The construction contractor for this project will selected through a competitive bidding process following approval of the final design.

Suppliers and Subcontractors

Suppliers and subcontractors include those parties providing materials, equipment, fabrication, or specialized construction services to the construction contractor. Suppliers are responsible for providing quality control on products before delivery to the site. CQC of suppliers and subcontractors is the responsibility of URS.

Surveyor

The surveyor will be a licensed surveyor in the State of Washington. The surveyor is responsible for staking work areas, providing requested surveys, conducting surveys for payment, and checking locations and elevations of the completed work. The surveyor is also responsible for producing survey data for use in production of record drawings.

7.1.3 Other Parties to the IA

In addition to parties to the CQA/CQC, the following parties will have input or responsibilities during the IA.

Ecology

Under the AO (see Section 1.0), as amended, Ecology requested this IA and reviews and approves all plans, reports and designs. The IA will be conducted only after Ecology approval of the final design. Ecology must review and approve the Interim Action Completion report, which will document construction and present record drawings. It is part of Ecology's role under an AO to ensure compliance of this IA with the substantive requirements of ARARs, and to provide

an opportunity for comment by the public, state agencies, and local governments (WAC 173-340-170[9][d]).

City of Everett

The IA is being conducted within the city limits of the City of Everett (City) and the City has reviewed the design and provided input as to the substantive requirements of City ordinances. The City will be kept informed of progress on the IA and will have the opportunity to review and comment on the Interim Action Completion report, which will document construction and present record drawings.

7.2 CQA DUTIES

This subsection lists the duties for the CQA personnel, all of whom are provided by URS for this project.

7.2.1 Project Engineer/CQA Officer

The project engineer for URS will also perform the duties of the CQA officer. For day-to-day field activities, or specific design tasks, the project engineer may designate a representative, referred to as the CQA monitor (Section 7.2.2). The project engineer's duties will be the following:

- Prepare and stamp the design drawings and specifications
- Attend selected meetings during construction and make on-site observations
- Prepare progress reports
- Recommend corrective action for any CQC deficiencies
- Perform changes to the design necessary during construction
- Prepare acceptance punch in cooperation with Boeing project manager
- Review and stamp record drawings

7.2.2 CQA Monitor

A CQA monitor may be designated by the CQA officer as an on-site representative to perform day-to-day CQA monitoring tasks, including the following:

- Act as liaison between the construction personnel, owner, and URS office staff
- Attend site meetings
- Observe construction and compare to IA design drawings
- Assist with preparation of the record drawings
- Prepare daily reports and ongoing photodocumentation
- Review results of CQC reports
- Report any CQC deficiencies to the CQA officer
- Maintain a log of construction activities including the following:

- Chronology of construction phases
- Type of work being performed during each construction day and equipment used
- Implementation of environmental protection BMPs
- Sediment volumes excavated and stored
- Restoration material volumes imported and placed
- Materials and equipment received and how they are handled, stored, and installed
- CQC sampling conducted, including type, method, and location
- Restoration and demobilization

• Perform and document sampling during construction (see Section 5.0)

7.3 SCOPE OF CONSTRUCTION QUALITY ASSURANCE

CQA for this project includes ensuring that construction is performed in accordance with the IA design drawings and that proper CQC is performed. CQA for this project does not include review of quality control procedures used by manufacturers or other suppliers beyond confirming that materials provided adhere to the standards specified in the IA design drawings.

7.4 CQA PROJECT CONTROLS

CQA project controls consist of observation, monitoring, logging, communication, and certification. Each of these project controls is described in the following sections.

7.4.1 Observation, Monitoring, and Logging

Observation, monitoring, and logging include field documentation of construction activities. These tasks will be performed by the CQA monitor, as described in Section 7.2.2. Documentation of these activities will include written daily logs, photographs, field sketches and notes, and copies of CQC sampling and analysis reports.

7.4.2 Communication

Effective CQA requires clear, open channels of communication. During the project, communication between CQA parties will occur as needed by telephone, fax, and e-mail to keep all CQA parties informed of IA progress. Communication will also occur during regularly

scheduled field meetings. All parties to the IA are welcome at such meetings. Minimum meeting attendees are listed below, together with a description of the meeting type and topics.

Kickoff Meeting

Before construction, a kickoff meeting will be held with the attendees to include, at a minimum, the owner, construction personnel, key subcontractors, the project engineer (also fulfilling the role of CQA officer), and the CQA monitor. The following activities will be included in the kickoff meeting:

- Discuss construction schedule.
- Perform a site walk with discussion of the following:
  - Health and safety
  - Site conditions and constraints on construction
  - Traffic control
  - Staging, access, and security
  - Storm contingency plan
  - Housekeeping and environmental protection
- Review critical design details
- Review CQA/CQC requirements
- Discuss the responsibilities of each party
- Confirm the methods and requirements for documenting and reporting
- Confirm the lines of authority and communication.

Weekly Progress Meeting

Once a week during construction a meeting will be held on site to assess the construction progress. This meeting will essentially be an expanded daily tailgate meeting (see following section). Minimum attendees will include the construction contractor and CQA monitor. Topics will include current status, planned activities for the next week, revisions to the design or schedule, and any anticipated or actual problems. The CQA monitor will document problems, decisions, or questions arising in this meeting in the daily report. The CQA officer or his representative will refer any matter requiring action to the appropriate parties.

Daily Tailgate Safety and Work Activities Meeting

Before the start of work each day, all workers present at the site will attend a tailgate meeting. This meeting will include a discussion of health and safety issues as described in the site-specific HASP, as well as the work planned for the day.

7.4.3 Acceptance

Acceptance of completed construction will be based on satisfactory CQC testing, as defined in the IA design drawings, and inspection by Boeing and the project engineer. During construction, the Boeing project manager and the project engineer will develop an acceptance punch list that provides line items to be satisfied for acceptance of the completed construction. Near the end of construction, the project engineer and Boeing project manager will walk the site with the construction personnel. During these visits, line items on the acceptance punch list will either be checked as completed by the project engineer or highlighted for further work by the construction personnel.

When all line items on the acceptance checklist have been completed to the satisfaction of the Boeing project manager and the project engineer, the project engineer will recommend acceptance of the completed construction to the owner (Boeing). Boeing will have final acceptance authority.

7.5 SPECIFIC CQA FOR ELEMENTS OF CONSTRUCTION

This section highlights the CQA tasks that are particularly relevant to each element of construction.

7.5.1 Sediment removal

CQA tasks specific to sediment removal are observation, confirmatory hand measurement of removal dimensions, sediment disposal sampling, confirmation soil sampling, and logging to document conformance of removal with the IA design drawings. The CQA monitor will perform the following tasks:

- Collect sediment disposal characterization samples, confirmation sediment samples, and construction dewatering samples in accordance with Sections 5.0 and 6.0
- Collect turbidity measurements downstream of the work area in accordance with Section 5.0
- Observed and document conformance to sediment handling practices, environmental protection BMPs, and traffic control requirements
- Prepare written and photographic documentation of the work, especially including any unanticipated conditions or requirements such as shoring, dewatering, or extra excavation

- Measure the approximate dimensions of areas where sediment is removed, estimate the depth of sediment removal, and estimate the volumes stored in rolloff containers for dewatering and disposal

7.5.2 Creek restoration

CQA tasks specific to creek restoration are observation, confirmatory hand measurement, and logging to document conformance of construction with the IA design drawings. The CQA monitor will observe and document the following:

- Written documentation of number of import material loads and type of material and review of test results showing material suitability
- Confirmatory hand measurements of stream features placement, such as anchored woody debris
- Written and photodocumentation of stream bed and bank restoration

7.5.3 Site Restoration and Demobilization

CQA tasks specific to site restoration and demobilization are observation and logging to document conformance with the design. The CQA monitor will observe and document the following:

- Before and after photodocumentation of the construction area
- Written and photodocumentation of access and staging restoration
- Written documentation of demobilization tasks accomplished and timeline

7.6 SCHEDULE OF TASKS

The estimated project schedule is show on Figure 8. This schedule will be revised once the construction contractor has been selected, and will be updated throughout the project.. All work is to be complete by the end of September 2006.

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Table 1
Summary of Soil Samples Collected During Vertical Profiling
Powder Mill Creek

Depth (ft bgs)	SED-PMG3A	SED-PMG3B	SED-PMG3C	SED-PMG3D	SED-PMG20
0.0 – 0.5	Sample collected: SED-PMG3A-0.5-051117	Sample collected: SED-PMG3B-0.5-051117	Sample collected: SED-PMG3C-0.5-051117	Sample collected: SED-PMG3D-0.5-051117	Sample collected: SED-PMG20-0.5-051117
0.5 – 1.0	REFUSAL	Sample collected: SED-PMG3B-1.0-051117	Sample collected: SED-PMG3C-1.0-051117	Sample collected: SED-PMG3D-1.0-051117	Sample collected: SED-PMG20-1.0-051117
1.0 – 1.5	X	Sample collected: SED-PMG3B-1.5-051117 (+ additional volume for grain size analysis)	REFUSAL	Sample collected: SED-PMG3D-1.5-051117	Samples collected: SED-PMG20-1.5-051117 SED-PMGDUP1-051117 (+ additional volume for grain size analysis)
1.5 – 2.0	X	REFUSAL	X	Sample collected: SED-PMG3D-2.0-051117	Sample collected: SED-PMG20-2.0-051117

Table 2
Vertical Concentration Profiles
November 2005 Sediment Samples from Powder Mill Creek

Sample Location	Date Collected	Depth (feet bgs)	PCBs (ug/kg, Aroclor 1254)	TOC (%)	Total Solids (%)
SED-PMG3B	11/17/2005	1/2	620	1.62	72.3
	11/17/2005	1	22	0.705	83.7
	11/17/2005	1-1/2	40	0.477	86.4
SED-PMG3A	11/17/2005	1/2	Not Analyzed		
SED-PMG3C	11/17/2005	1/2	190	1.06	88.4
	11/17/2005	1	38	1.03	82.6
SED-PMG3D	11/17/2005	1/2	280	1.91	83.6
	11/17/2005	1	19 U	0.079	80.8
	11/17/2005	1-1/2	19 U	0.058	82.6
	11/17/2005	2	19 U	0.058	83.1
SED-PMG20	11/17/2005	1/2	140	0.687	81.3
	11/17/2005	1	39	0.589	78.0
	11/17/2005	1-1/2	19 U	0.082	82.5
	11/17/2005 (dup)	1-1/2	19 U	0.163	85.5
	11/17/2005	2	19 U	0.113	85.8

Table 3
Summary of Rainfall Totals

Station:(452675) EVERETT JR COLLEGE (from 1948 to 2005)

Monthly Rainfall Summary

	Mean inches	Highest inches	Year -	Lowest inches	Year -
January	4.57	9.77	1971	0.54	1985
February	3.40	6.75	1958	0.40	1993
March	3.57	6.08	1997	0.55	1965
April	2.71	5.69	2005	0.65	1951
May	2.36	6.03	1977	0.63	1963
June	2.18	5.52	1956	0.25	1961
July	1.19	3.57	1993	0.00	1958
August	1.34	4.23	1960	0.00	1967
September	1.97	5.42	1969	0.27	1975
October	3.45	8.53	1975	0.08	1987
November	4.87	9.30	1983	0.56	1952
December	5.06	8.53	1955	0.76	1985

Daily Rainfall Totals

	1-day maximum inches	dd/yyyy	# days ≥ 0.01"	# days ≥ 0.10"	# days ≥ 0.50"	#days ≥ 1.00"
January	2.33	18/1986	18	12	3	0
February	1.50	04/1991	16	10	2	0
March	1.76	03/1991	18	11	2	0
April	1.40	28/1967	15	8	1	0
May	1.14	11/1951	12	7	1	0
June	1.72	17/1981	10	6	1	0
July	1.60	01/1954	6	3	1	0
August	1.70	26/1960	7	4	1	0
September	1.63	06/1984	9	5	1	0
October	1.95	05/1990	14	9	2	0
November	3.62	25/1990	18	12	3	1
December	1.93	10/1993	19	13	3	1

Table 4
24-Hour Rainfall Versus Return Frequency

Return Period	Probability	Inches of Rain
2-year	0.50	1.8
5-year	0.20	2.3
10-year	0.10	2.6
25-year	0.04	3.1
50-year	0.02	3.4
100-year	0.01	3.8

Table 5
Vertical Concentration Profiles with Historical Results
Sediment Samples from Powder Mill Creek

Sample Location	Date Collected	Depth (feet bgs)	PCBs (ug/kg, Aroclor 1254)	TOC (%)	Total Solids (%)
SED-PMG3B	11/17/2005	1/2	620	1.62	72.3
	8/22/2005	1/2	510	2.22	89.9
	1/6/2005	1/2	1,800 J	4.35	70.8
	1/6/2005*	1/2	2,500	1.98	
	11/17/2005	1	22	0.705	83.7
	11/17/2005	1-1/2	40	0.477	86.4
SED-PMG3A	11/17/2005	1/2		Not Analyzed	
	6/14/2005	1/2	430	0.973	81.6
	1/6/2005	1/2	810	2.05	75.4
	1/6/2005*	1/2	1,100	1.53	
SED-PMG3C	11/17/2005	1/2	190	1.06	88.4
	1/6/2005	1/2	1,200	3.36	79.0
	1/6/2005*	1/2	880	1.18	
	11/17/2005	1	38	1.03	82.6
SED-PMG3D	11/17/2005	1/2	280	1.91	83.6
	1/6/2005	1/2	340	0.804	84.6
	1/6/2005*	1/2	300	0.1	
	11/17/2005	1	19 U	0.079	80.8
	11/17/2005	1-1/2	19 U	0.058	82.6
	11/17/2005	2	19 U	0.058	83.1
SED-PMG20	11/17/2005	1/2	140	0.687	81.3
	6/14/2005	1/2	51	0.300	89.3
	9/17/2004	1/2	180	4.05 J	81.3
	9/17/2004 (dup)	1/2	300	1.17J	84.2
	3/18/2003	1/2	3,700	9.4	51.3
	11/17/2005	1	39	0.589	78.0
	11/17/2005	1-1/2	19 U	0.082	82.5
	11/17/2005 (dup)	1-1/2	19 U	0.163	85.5
	11/17/2005	2	19 U	0.113	85.8

* Ecology split sample

Table 6
Construction Dewatering Water Influent Concentrations and Treatment Goals

Constituent	Expected Maximum Influent Concentration	Treatment Goal	Basis for Treatment Goal	Treatment Expected to be Necessary?
Arsenic	NA	0.5 mg/L	Everett POTW limit	No
Cadmium	NA	0.24 mg/L	Everett POTW limit	No
Chromium	<0.005 mg/L	5.0 mg/L	Everett POTW limit	No
Copper	0.006 mg/L	3.0 mg/L	Everett POTW limit	No
Lead	0.001 mg/L	1.89 mg/L	Everett POTW limit	No
Mercury	NA	0.1 mg/L	Everett POTW limit	No
Nickel	NA	2.83 mg/L	Everett POTW limit	No
Silver	NA	0.49 mg/L	Everett POTW limit	No
Zinc	0.082 mg/L	4.0 mg/L	Everett POTW limit	No
pH	6 to 8 SU	5.0 to 10.0 SU	Everett POTW limit	No
Closed Cup Flashpoint	Greater than 140 degrees F	Minimum 140 degrees F	Everett POTW limit	No
TCE	0.0058 mg/L	Non-interference	Everett POTW limit	No
PCBs	<0.000017 mg/L	0.003 mg/L	TSCA	No
PAHs	<0.000010 mg/L	Non-interference	Everett POTW limit	No

Although historic data are not available for some metals in water for which the Everett POTW has an established discharge limit, there is no known source for these metals at the Boeing Everett Facility. Metals for which data are available are found at concentrations several orders of magnitude below the discharge limits. Construction dewatering water will be filtered to reduce the total suspended solids and sampled for the complete list of metals (and other potential contaminants) in this table prior to discharge.

Notes:
F - Fahrenheit
PCBs - polychlorinated biphenyls
PAHs - polynuclear aromatic hydrocarbons
mg/L - micrograms per liter
NA - historic samples were not analyzed for this metal because there is no known source of this metal at the facility
POTW - publicly-owned treatment works
SU - standard units
TCE- trichloroethene
TSCA - toxic substances control act limit for sanitary sewer discharge
< - less than

Table 7
Existing Woody Plant Species

Common Name	Scientific Name	Native/Introduced
Big-leaf maple	*Acer macrophyllum*	Native
Blackcap raspberry	*Rubus leucodermis*	Native
Douglas-fir	*Pseudotsuga menziesii*	Native
Hardhack	*Spiraea douglasii*	Native
Himalayan blackberry	*Rubus armeniacus*	Introduced
Multifora rose	*Rosa multiflora*	Introduced
Oceanspray	*Holodiscus discolor*	Native
Red alder	*Alnus rubra*	Native
Red elderberry	*Sambucus racemosa*	Native
Red-osier dogwood	*Cornus sericea*	Native
Salmonberry	*Rubus spectabilis*	Native
Sitka willow	*Salix sitchensis*	Native
Trailing blackberry	*Rubus ursinus*	Native
Western hemlock	*Tsuga heterophylla*	Native
Western redcedar	*Thuja plicata*	Native

Table 8
Analytical Plan
Basis of Design - Sediment Removal in Powder Mill Creek
Corrective Action Program
Boeing Everett Plant

				LABORATORY ANALYSES													
				Sediment Samples							Water Samples						
Media/Location	Sampling Frequency	Data Turn-Around	Turbidity - Field Analysis	PCBs by EPA Method 8082 [1]	PAHs by EPA Method 8270D SIM [2]	Total Metals	TCLP RCRA 8 Metals	TCLP, VOCs (TCE, PCE, vinyl chloride)	Total Organic Carbon	Total Solids	PCBs by EPA Method 8082 [3]	PAHs by EPA Method 8270D-SIM (Pro-Sep Modified) [4]	VOCs by EPA Method 8260B [5]	Total Metals [6]	pH	Closed-Cup Flashpoint
Sediment Samples																	
Sediment Disposal Characterization	Composite for each Roll-off Box	2 weeks		X	X	X [7]	X	X		X							
Creek Bed Confirmation	One Time at Completion of Sediment Removal	24 hrs		X	X	X [8]			X	X							
Water Discharge Characterization																	
Influent Samples	First 4 hours of operation first day, once daily thereafter	varies/24 hrs last influent per tank									X	X	X	X	X	X	
Storage Tank	One sample each full tank prior to discharge	24 hrs									X	X	X	X	X	X	
Surface Water Monitoring During Construction	3 times prior to construction, 3 times daily thereafter	Field	X														
Import Material Samples	Composite for each of 2 material types	24 hrs		X	X	X [8]			X	X							

Notes:

[1] Sediment samples will be analyzed to achieve a 20 ug/kg reporting limit or lower for Aroclors 1016, 1232, 1242, 1248, 1254, and 1260 and 40 ug/kg for Aroclor 1221.

[2] PAHs will be analyzed via SIM technology to achieve a 6 to 7 ug/kg reporting limit for each PAH.

[3] All water samples will be analyzed for PCBs to achieve a 0.1 ug/L reporting limit for each Aroclor.

[4] PAHs will be analyzed with SIM technology modified with Pro-Sep injection to achieve reporting limits of 0.01 ug/L for each PAH.

[5] Samples will be analyzed for standard VOC list for the Boeing Everett Corrective Action with a reporting limit of 0.2 ug/L for TCE.

[6] Metals will include arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc.

[7] Metals will include copper, nickel, and zinc.

[8] Metals will include barium, chromium, copper, lead, and zinc.

Table 9
Sediment Sample Collection, Preservation, And Holding Time Criteria
Basis of Design - Sediment Removal in Powder Mill Creek
Corrective Action Program
Boeing Everett Plant

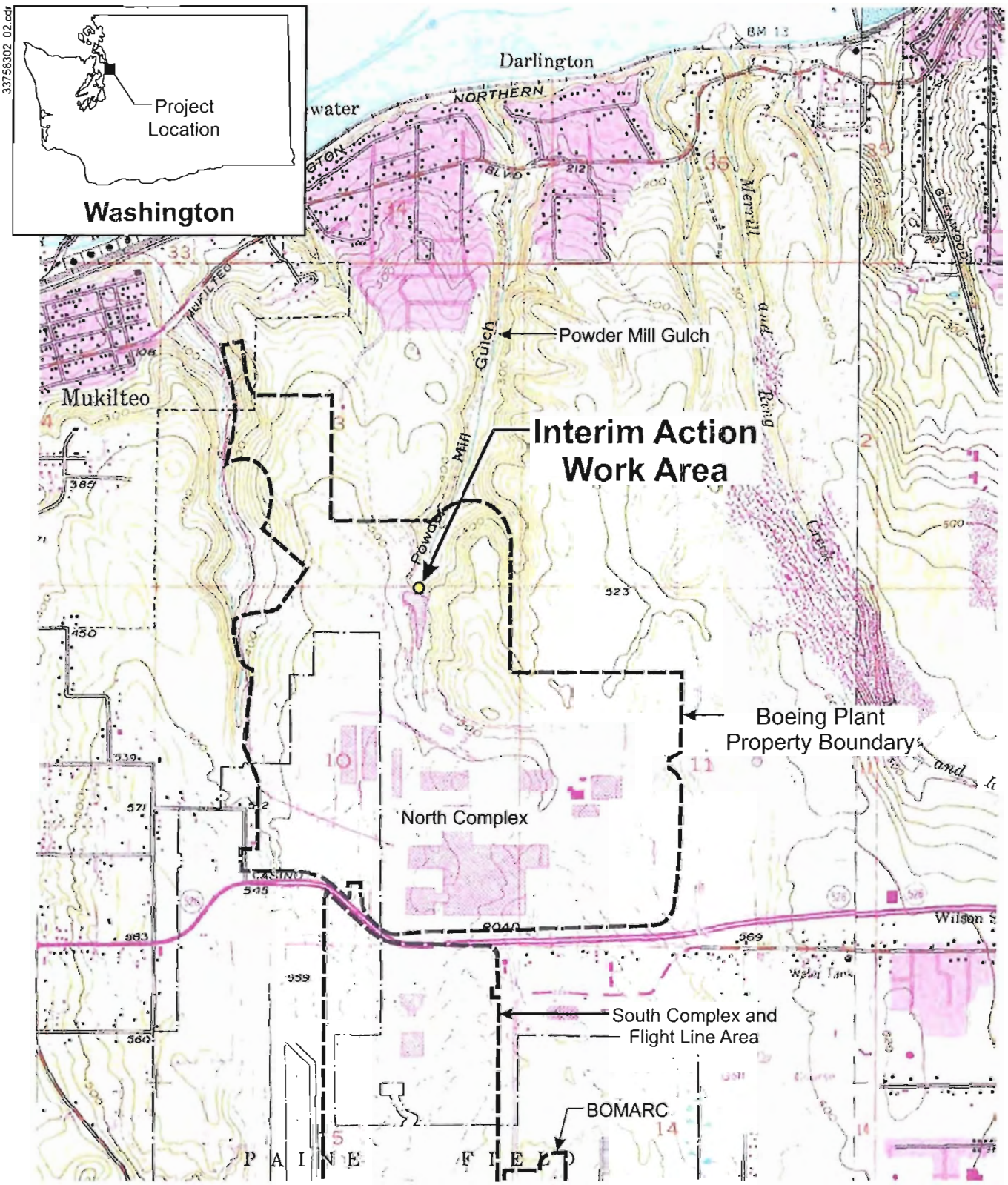
Parameter	Method Reference	Method	Minimum Sample Amount	Container Type	Preservation	Extraction Holding Time	Analysis Holding Time
Polynuclear Aromatic Hydrocarbons (PAHs)	SW-846	8270D SIM	30 g	8-oz glass jar w/teflon lined lid	Cool to 4°C	14 days	40 days *
Polychlorinated Biphenyls (PCBs)	SW-846	8082	30 g	8-oz glass jar w/teflon lined lid	Cool to 4o C	14 days	40 days *
Total Metals/TCLP Metals	SW-846	EPA 6000/7000 Series, 1311	100 g	8-oz glass jar w/teflon lined lid	Cool to 4°C	NA	6 months (28 days for Mercury)
TCLP, VOCs (TCE, PCE, vinyl chloride)	SW-846	EPA/82600/1311	100 g	8-oz glass jar w/teflon lined lid	Cool to 4°C	14 days	14 days
Total Organic Carbon (TOC)	Plumb, 1981	Plumb, 1981	2 g	4-oz glass jar w/teflon lined lid	Cool to 4°C	NA	28 days

* - Days from extraction date.
** VOCs - volatile organic compounds

Table 10
Water Sample Collection, Preservation, And Holding Time Criteria
Basis of Design - Sediment Removal in Powder Mill Creek
Corrective Action Program
Boeing Everett Plant

Parameter	Method Reference	Method	Minimum Sample Amount	Container Type	Preservation	Extraction Holding Time	Analysis Holding Time
Volatile Organic Compounds (VOCs)	SW-846	8260B	20 ml	3-40 ml VOA glass vials with teflon septum (No Headspace)	HCl pH<2, cool to 4°C	NA	14 days
Polynuclear Aromatic Hydrocarbons (PAHs)	SW-846	8270D SIM Pro-Sep Mod	1000 mL	2-1 L ml amber glass, Teflon lined cap	Cool to 4°C	7 days	40 days*
Polychlorinated Biphenyls (PCBs)	SW-846	8082 (standard and MTCA, 0.1 ug/L RL)	500 ml	2-500 ml amber glass, Teflon lined cap	Cool to 4°C	7 days	40 days*
Total Metals	SW-846	EPA 6000 / 7000 Series	250 ml	1000 ml HDPE	HNO_3 to pH <2, cool to 4°C	NA	6 months (Mercury is 28 days)

* - Days from extraction date.



Map created with TOPO!™ © 1997 Wildflower Productions, www.topo.com, based on USGS topographic map

0 0.5 1.0

Approximate Scale in Miles

Job No. 33758302

Figure 1

Location Map

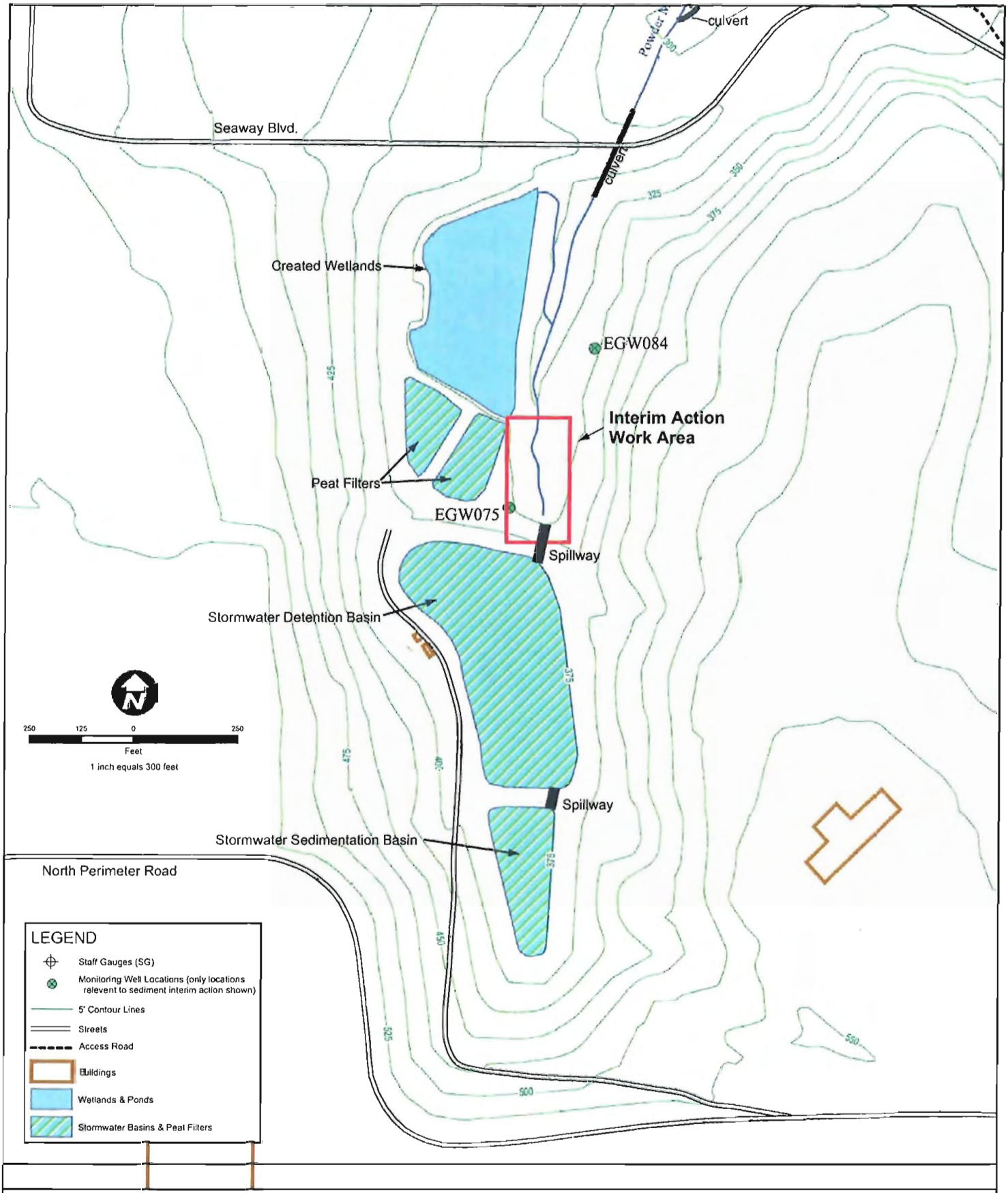


Figure 2
Area Plan

URS

Boeing Commercial Airplanes, Everett Plant
Basis of Design Report and Site Management Plan
Powder Mill Creek Sediment Removal - April 2006

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33758302_03.cdr

LEGEND

- Sample location
- ( ) 1998-2003 samples
- ( ) 2004 samples
- ( ) WDOE Manchester Laboratory samples
- ( ) January 2005 samples
- ( ) June 2005 samples
- ( ) August and November 2005 samples
- [ ] June 2005 PCB (Aroclor 1260)
- **(180/300)** Field duplicate analytical results
- **(414, 360)** Multiple sample results from oldest to most recent for specified sample period
- J Estimated value
- SOL Accumulated solids
- SED Sediment

NOTES

1. All results presented in micrograms per kilogram (µg/kg)
2. Results are for Aroclor 1254 unless otherwise noted

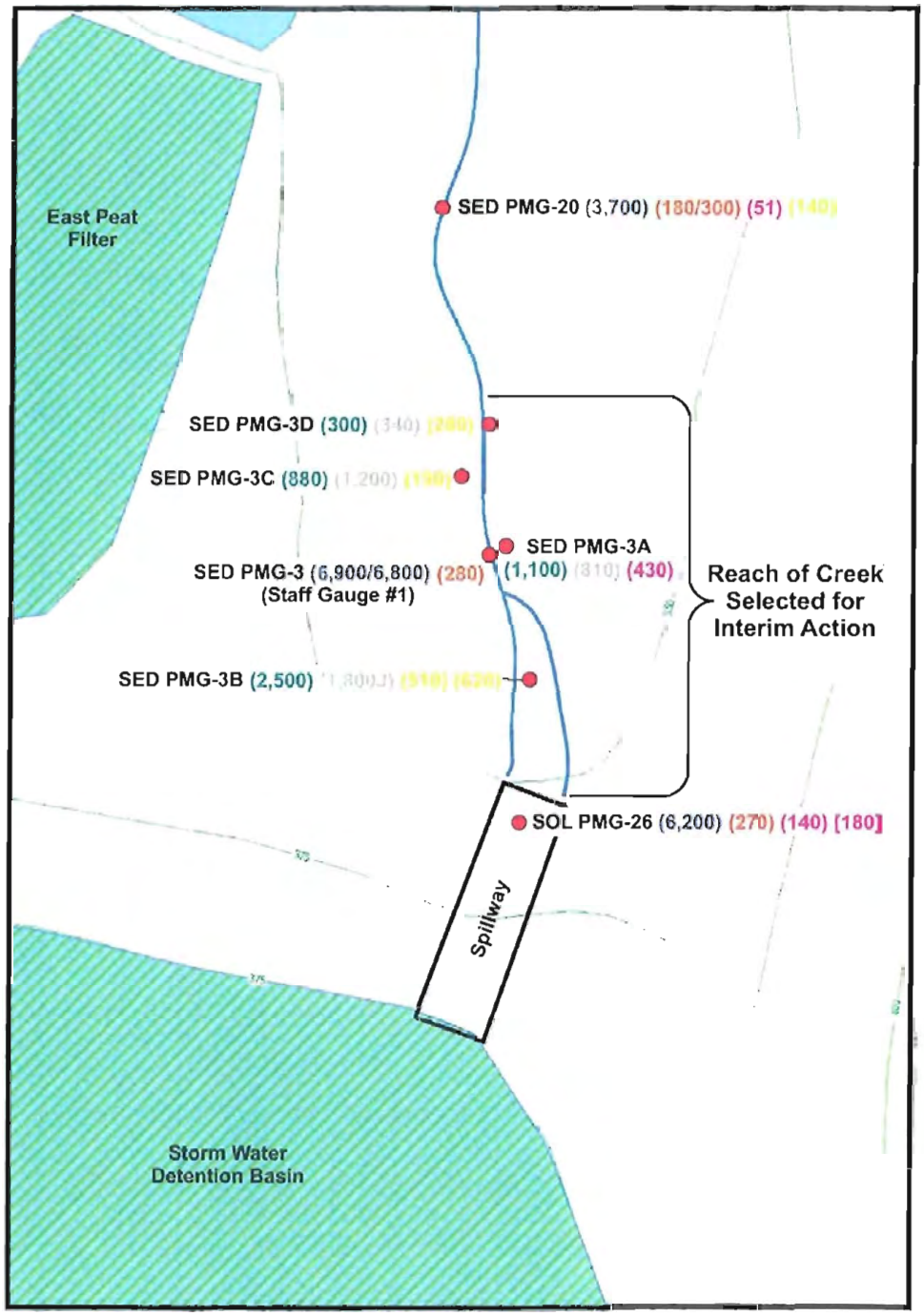

Figure 3

Work Area Plan View

Job No. 33758302

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Boeing Commercial Airplanes, Everett Plant
Basis of Design Report and Site Management Plan
Powder Mill Creek Sediment Removal - April 2006

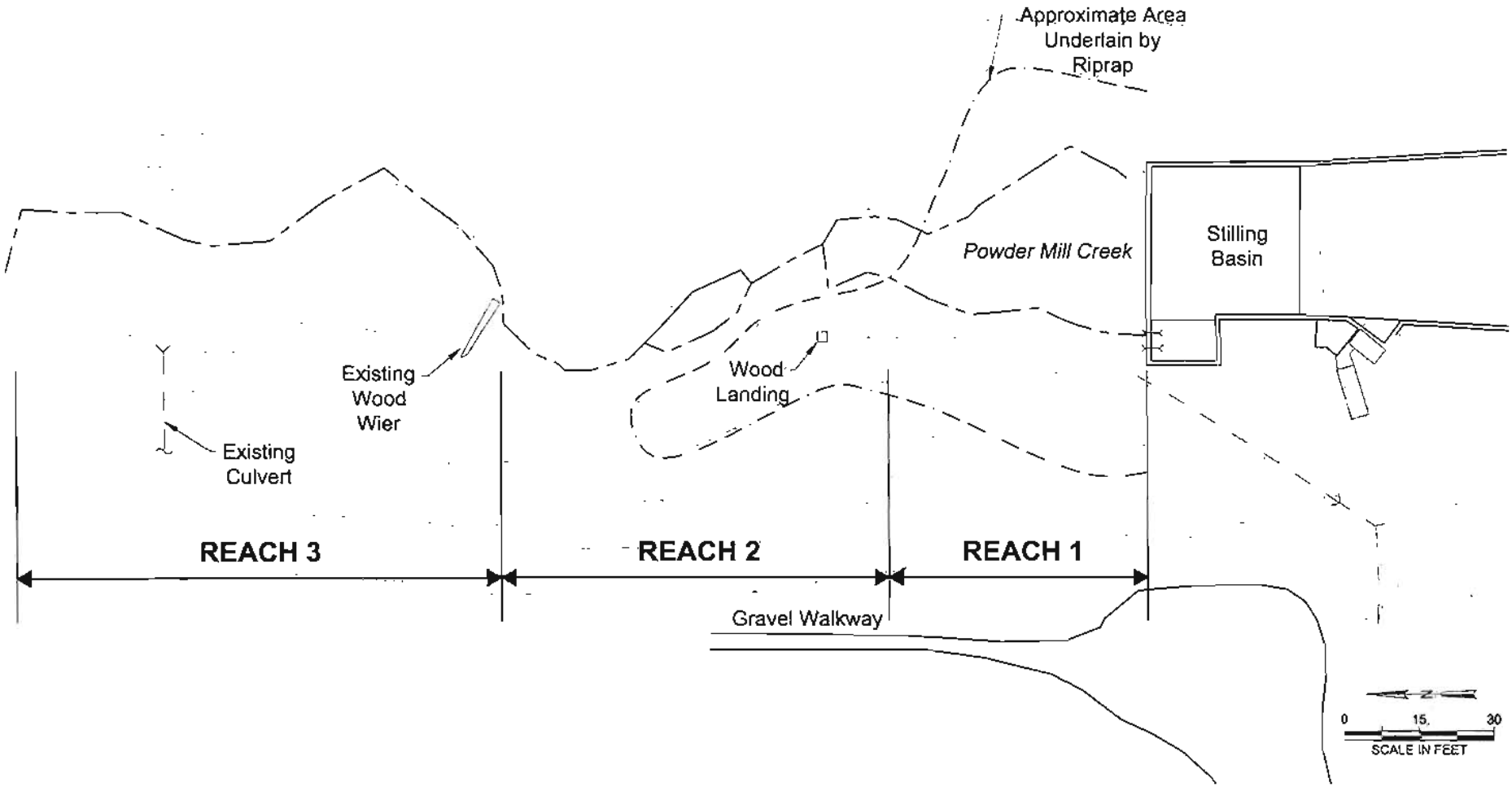

Figure 4

Biologic Survey Creek Reaches

Boeing Commercial Airplanes, Everett Plant
Basis of Design Report and Site Management Plan
Powder Mill Creek Sediment Removal - April 2006

Job No. 33758302

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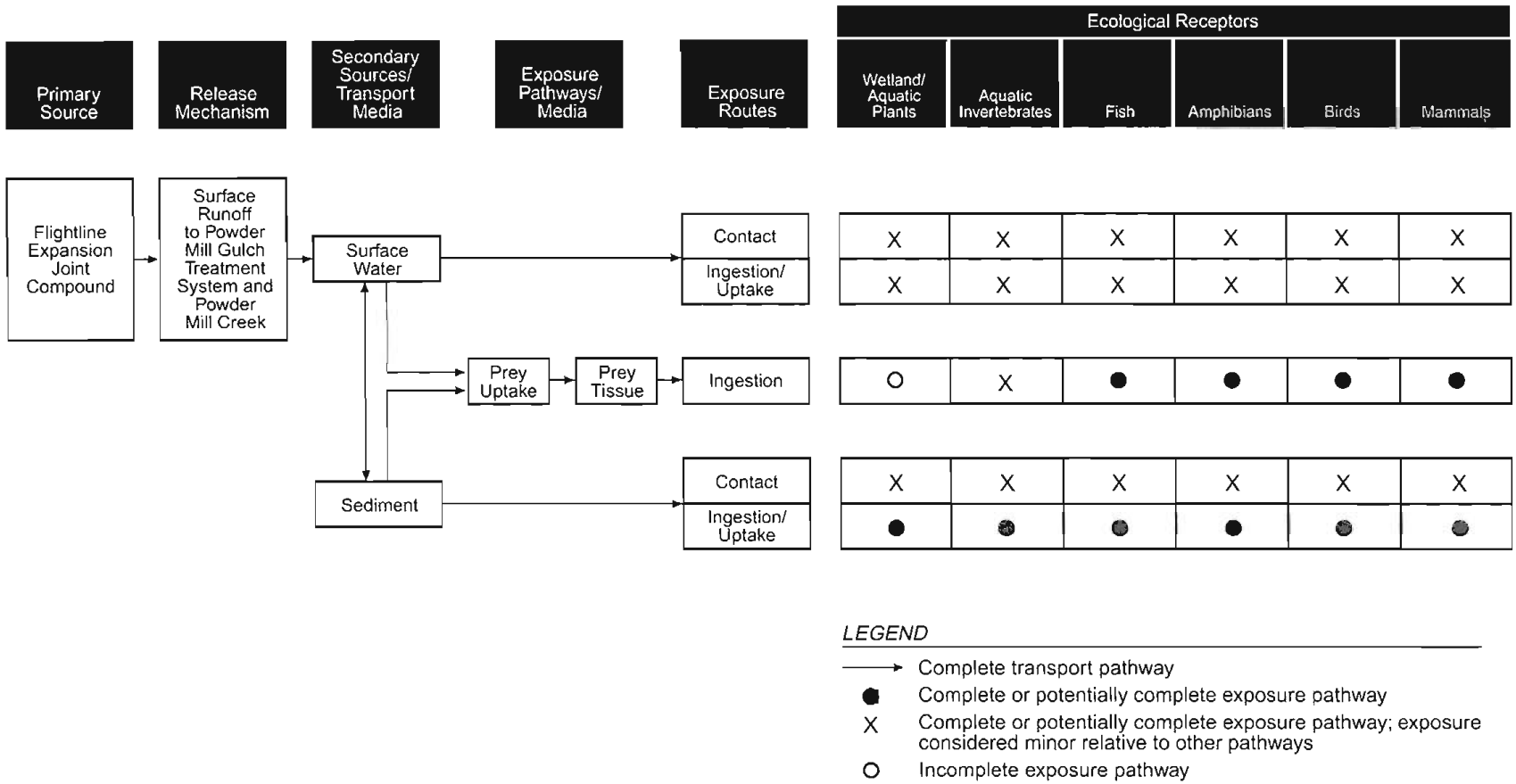

Figure 5

Conceptual Site Model for Ecological Exposure Pathways

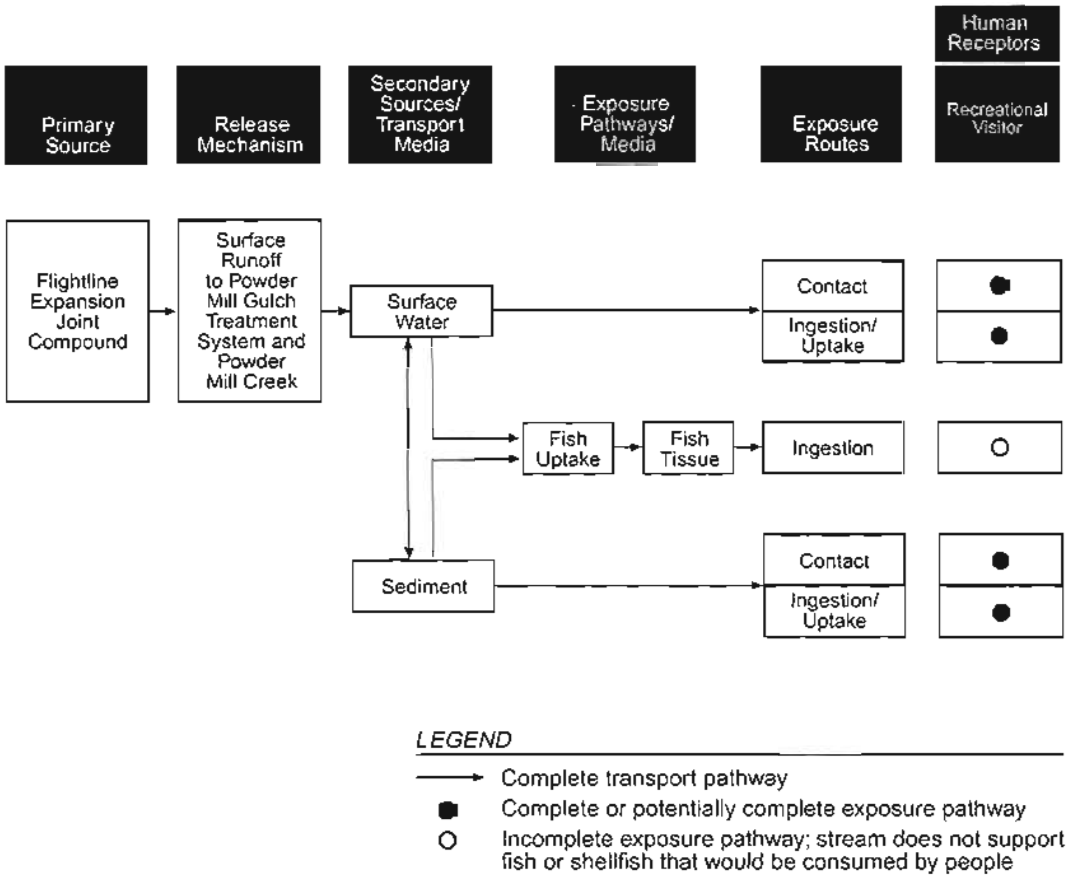

Figure 6

Conceptual Site Model for Human Exposure Pathways

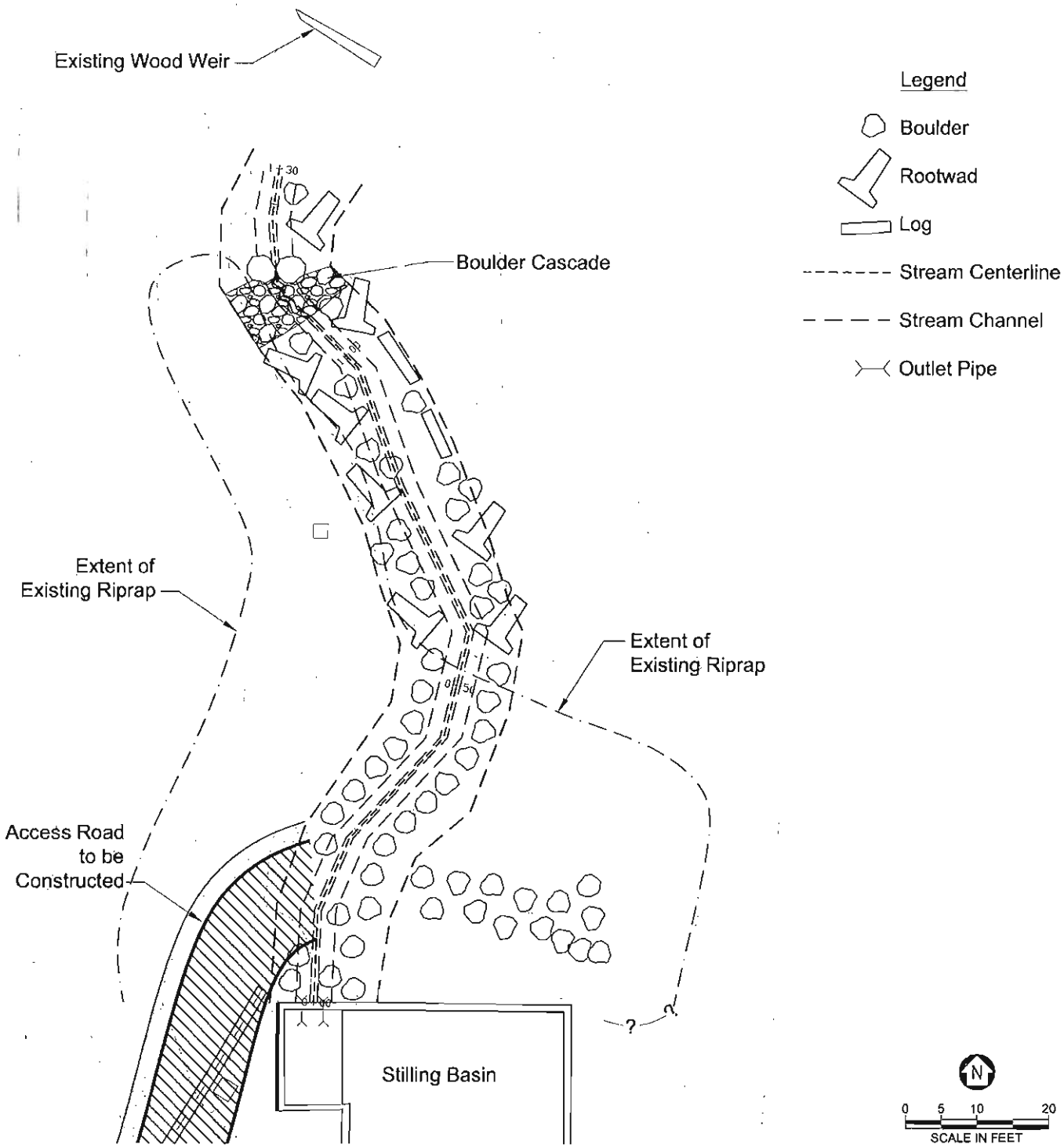

Figure 7

Generalized Stream Restoration Plan

Job No. 33758302

Boeing Commercial Airplanes, Everett Plant
Basis of Design Report and Site Management Plan
Powder Mill Creek Sediment Removal - April 2006

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Interim Action Schedule
Sediment Removal in Powder Mill Creek
Corrective Action Program
BCAG Everett Plant

ID		Task Name	Duration	Start	Finish
39		**Permitting**	**172 days**	**Wed 10/5/05**	**Wed 5/31/06**
40	✓	**Refine substantive requirements**	**75 days**	**Wed 10/5/05**	**Tue 1/17/06**
45	✓	Electrofishing permit	30 edays	Fri 10/14/05	Sun 11/13/05
46		City review of draft design	21 edays	Fri 4/7/06	Fri 4/28/06
47		State review of draft design	21 edays	Fri 4/7/06	Fri 4/28/06
48	✓	USACE permit review	88 edays	Mon 11/14/05	Fri 2/10/06
49	✓	USACE permit obtained	1 day	Fri 2/10/06	Fri 2/10/06
50		Public comment period	30 edays	Mon 5/1/06	Wed 5/31/06
51		**Procurement**	**60 days**	**Mon 5/15/06**	**Mon 8/7/06**
52		Bid package preparation	45 edays	Mon 5/15/06	Thu 6/29/06
53		Solicit bids	1 day	Fri 6/30/06	Fri 6/30/06
54		Site walk	1 day	Mon 7/10/06	Mon 7/10/06
55		Bidders prepare proposals	21 edays	Fri 6/30/06	Fri 7/21/06
56		Proposal evaluations	14 edays	Fri 7/21/06	Fri 8/4/06
57		Award construction	1 day	Mon 8/7/06	Mon 8/7/06
58		**Construction**	**47 days**	**Tue 8/15/06**	**Wed 10/18/06**
59		Submittals	1 day	Fri 8/18/06	Fri 8/18/06
60		Moblization	7 edays	Tue 8/15/06	Tue 8/22/06
61		Build access and staging	7 edays	Tue 8/22/06	Tue 8/29/06
62		Remove sediment	5 days	Tue 8/29/06	Mon 9/4/06
63		Dewater sediment	1 day	Tue 9/5/06	Tue 9/5/06
64		Dispose of sediment	1 day	Wed 9/20/06	Wed 9/20/06
65		Treat and dispose of water	1 day	Thu 9/21/06	Thu 9/21/06
66		Confirmation sampling and analysis	3 days	Tue 9/5/06	Thu 9/7/06
67		Reconstruct creek	10 days	Fri 9/8/06	Thu 9/21/06
68		Demobilization	5 days	Fri 9/22/06	Thu 9/28/06
69		Replanting and final restoration	1 day	Wed 10/18/06	Wed 10/18/06

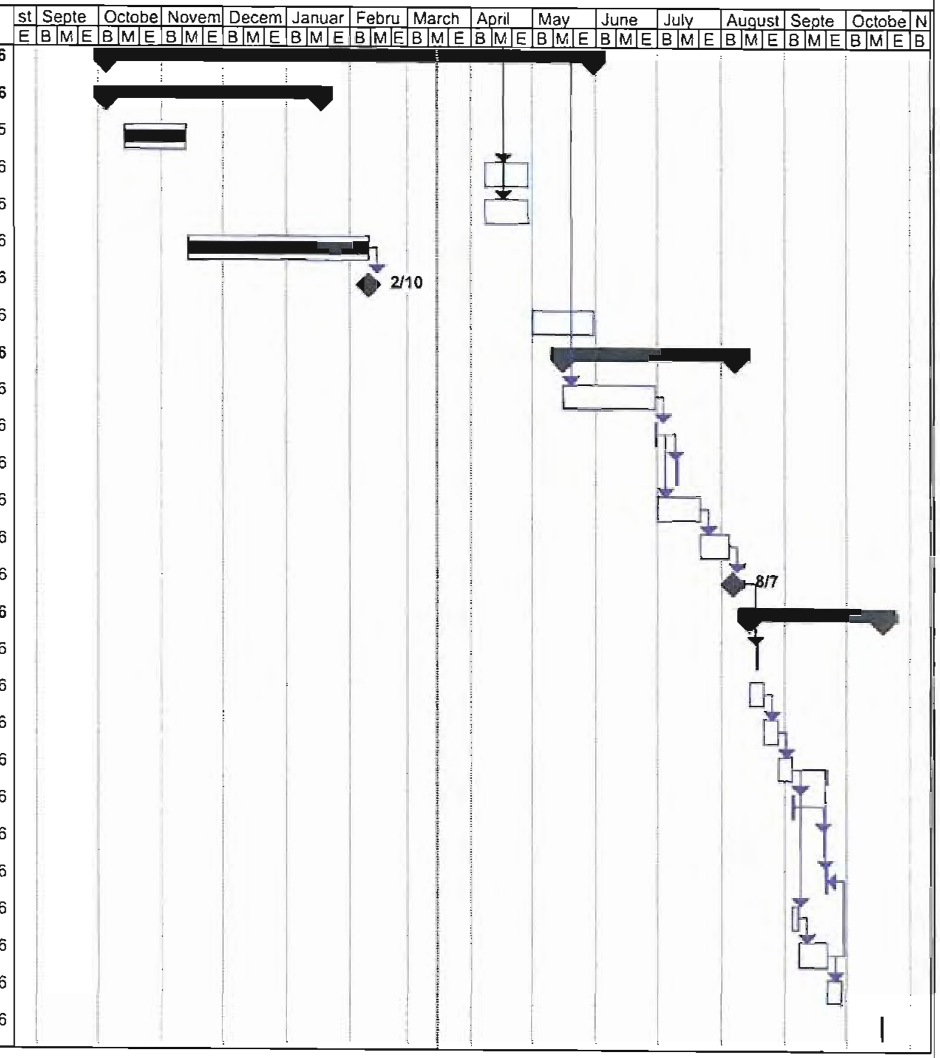
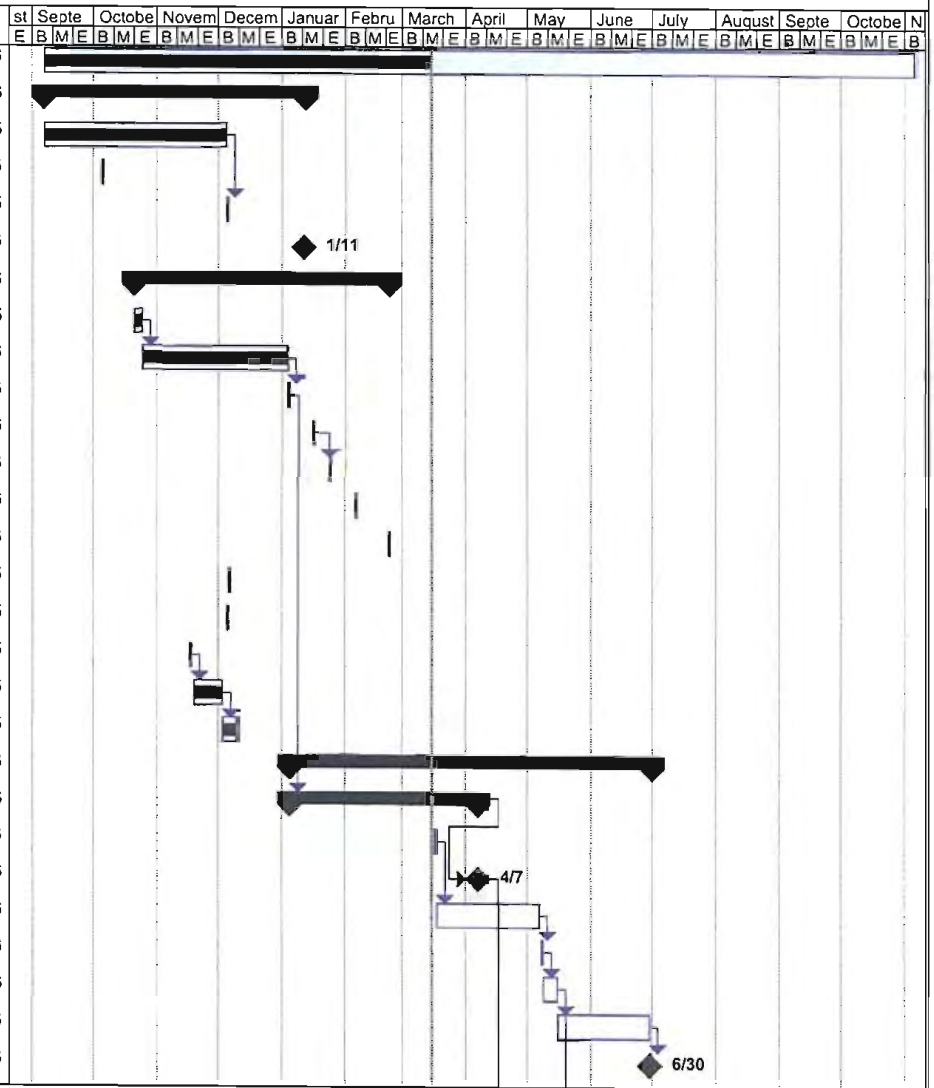


FIGURE 8
Project: Estimated Schedule
Date: Wed 3/15/06

Task		Summary		Rolled Up Progress		Deadline	
Split		Rolled Up Task		External Tasks			
Progress		Rolled Up Split		Project Summary			
Milestone		Rolled Up Milestone		External Milestone			

Interim Action Schedule
Sediment Removal in Powder Mill Creek
Corrective Action Program
BCAG Everett Plant

ID	Task Name	Duration	Start	Finish
1	**Project Management**	**425 edays**	**Wed 9/7/05**	**Mon 11/6/06**
2	**Complete IAWP**	**92 days**	**Wed 9/7/05**	**Thu 1/12/06**
3	Ecology review of IAWP	89 edays	Wed 9/7/05	Mon 12/5/05
4	Initial comment discussion meeting	1 day	Wed 10/5/05	Wed 10/5/05
5	Ecology comments on IAWP	1 day	Mon 12/5/05	Mon 12/5/05
6	Comment resolution meeting	1 eday	Wed 1/11/06	Thu 1/12/06
7	**Pre-Design Sampling**	**89 days**	**Fri 10/21/05**	**Wed 2/22/06**
8	Topographic survey (LIDAR)	2 days	Fri 10/21/05	Mon 10/24/05
9	LIDAR data processing	71 edays	Mon 10/24/05	Tue 1/3/06
10	Revised LIDAR topographic map	1 day	Wed 1/4/06	Wed 1/4/06
11	Supplementary ground survey scope	1 day	Mon 1/16/06	Mon 1/16/06
12	Meet surveyors on site	1 day	Tue 1/24/06	Tue 1/24/06
13	Conduct supplementary ground survey	1 day	Mon 2/6/06	Mon 2/6/06
14	Receive survey data	1 day	Wed 2/22/06	Wed 2/22/06
15	Ecological reconnaissance	1 day	Tue 12/6/05	Tue 12/6/05
16	Geotechnical reconnaissance	1 day	Mon 12/5/05	Mon 12/5/05
17	Sediment sampling	1 day	Thu 11/17/05	Thu 11/17/05
18	Laboratory data analysis	14 edays	Fri 11/18/05	Fri 12/2/05
19	Data validation and evaluation	7 edays	Fri 12/2/05	Fri 12/9/05
20	**Design**	**129 days**	**Thu 1/5/06**	**Fri 6/30/06**
21	**Prepare draft design**	**67 days**	**Thu 1/5/06**	**Thu 4/6/06**
32	Preliminary draft to Ecology	1 day	Fri 3/17/06	Fri 3/17/06
33	Deliver draft design to Ecology	1 day	Fri 4/7/06	Fri 4/7/06
34	Ecology review of design	50 edays	Fri 3/17/06	Sat 5/6/06
35	Comment resolution meeting	1 day	Mon 5/8/06	Mon 5/8/06
36	Followup to comment resolution	7 edays	Mon 5/8/06	Mon 5/15/06
37	Prepare final design	45 edays	Mon 5/15/06	Thu 6/29/06
38	Deliver final design	1 day	Fri 6/30/06	Fri 6/30/06



Task
Split
Progress
Milestone
Summary
Rolled Up Task
Rolled Up Split
Rolled Up Milestone
Rolled Up Progress
External Tasks
Project Summary
External Milestone
Deadline

FIGURE 8
Project: Estimated Schedule
Date: Wed 3/15/06

APPENDIX A

Permits and Substantive Requirements

DEPARTMENT OF THE ARMY
SEATTLE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 3755
SEATTLE, WASHINGTON 98124-3755

REPLY TO
ATTENTION OF

Regulatory Branch

FEB - 8 2006

Boeing Commercial Aircraft Company
Boeing Shared Services Group, Environmental Remediation
Mr. Nick Garson
Post Office Box 3707 MC 1W-12
Seattle, Washington 98124-2207

Reference: 200501319
Boeing Company

Gentlemen:

Our regulatory program utilizes a series of nationwide permits (NWPs) to authorize specific categories of work that have minimal impact on the aquatic environment when conducted in accordance with the permit conditions (*Federal Register*, January 15, 2002, Vol. 67, No. 10). Based on the information you provided to us, NWP 38, *Cleanup of Hazardous and Toxic Waste*, authorizes your proposal to remove PCB impacted sediment from Powder Mill Creek, as depicted on the enclosed drawings dated August 2005. The proposed work is being done as an Interim Action under the Washington State Model Toxic Control Act. The project would occur in Powder Mill Creek at Everett, Snohomish County, Washington.

In order for this NWP authorization to be valid, you must ensure that the work is performed in accordance with the enclosed *Nationwide Permit 38, Terms and Conditions.*

In order for this NWP authorization to be valid, the Washington State Department of Ecology (Ecology) must have issued or waived Section 401 Water Quality Certification (WQC) and, for Washington's 15 coastal counties, concurred with or waived a Coastal Zone Management (CZM) consistency determination. We are unable to determine whether or not your project requires an individual WQC and CZM consistency determination response. Before you can proceed with the work authorized by this NWP, you must contact the following Ecology office for their determination:

Nationwide Permit Coordinator
Department of Ecology
SEA Program
Post Office Box 47600
Olympia, Washington 98504-7600
Telephone (360) 407-6926

If more than 180 days pass without the State responding to your concurrence requests, your requirement to obtain an individual WQC and CZM consistency determination response becomes waived. You may then proceed to construction.

We have reviewed your project pursuant to the requirements of the Endangered Species Act (ESA). We have determined that this project will not affect any species listed as threatened or endangered under the ESA (or a species proposed for such designation) or destroy or adversely modify the critical habitat of such species. As such, this project satisfies the requirements of NWP National General Condition 11.

Our verification of this NWP is valid for 2 years from the date of this letter unless the NWP is modified, reissued or revoked. All of the existing NWPs are scheduled to be modified, reissued, or revoked prior to March 18, 2007. It is incumbent upon you to remain informed of changes to the NWPs. We will issue a public notice when the NWPs are reissued. Furthermore, if you commence or are under contract to commence this activity before the date that the relevant nationwide permit is modified or revoked, you will have twelve (12) months from the date of the modification or revocation of the NWP to complete the activity under the present terms and conditions of this nationwide permit. This verification includes a preliminary jurisdictional determination that is not appealable.

If this project complies with all terms and conditions of this NWP, you will need no further authorization from us. However, you must still obtain all State and local permits that apply to your project. Also, we remind you that failure to comply with all terms and conditions of this NWP verification invalidates your authorization and could result in a violation of Section 404 of the Clean Water Act and/or Section 10 of the 1899 Rivers and Harbors Act.

Upon completing the authorized work, please fill out and return the enclosed *Certificate of Compliance with Department of the Army Permit* form to the address indicated on the form. Your signature on this form is our assurance that the completed work and any required mitigation was conducted in accordance with the terms and conditions of this NWP.

Thank you for your cooperation during the permit process. Your efforts help us protect our nation's aquatic resources, including wetlands. We are interested in your thoughts and opinions concerning your experience with our Regulatory Program and encourage you to complete a

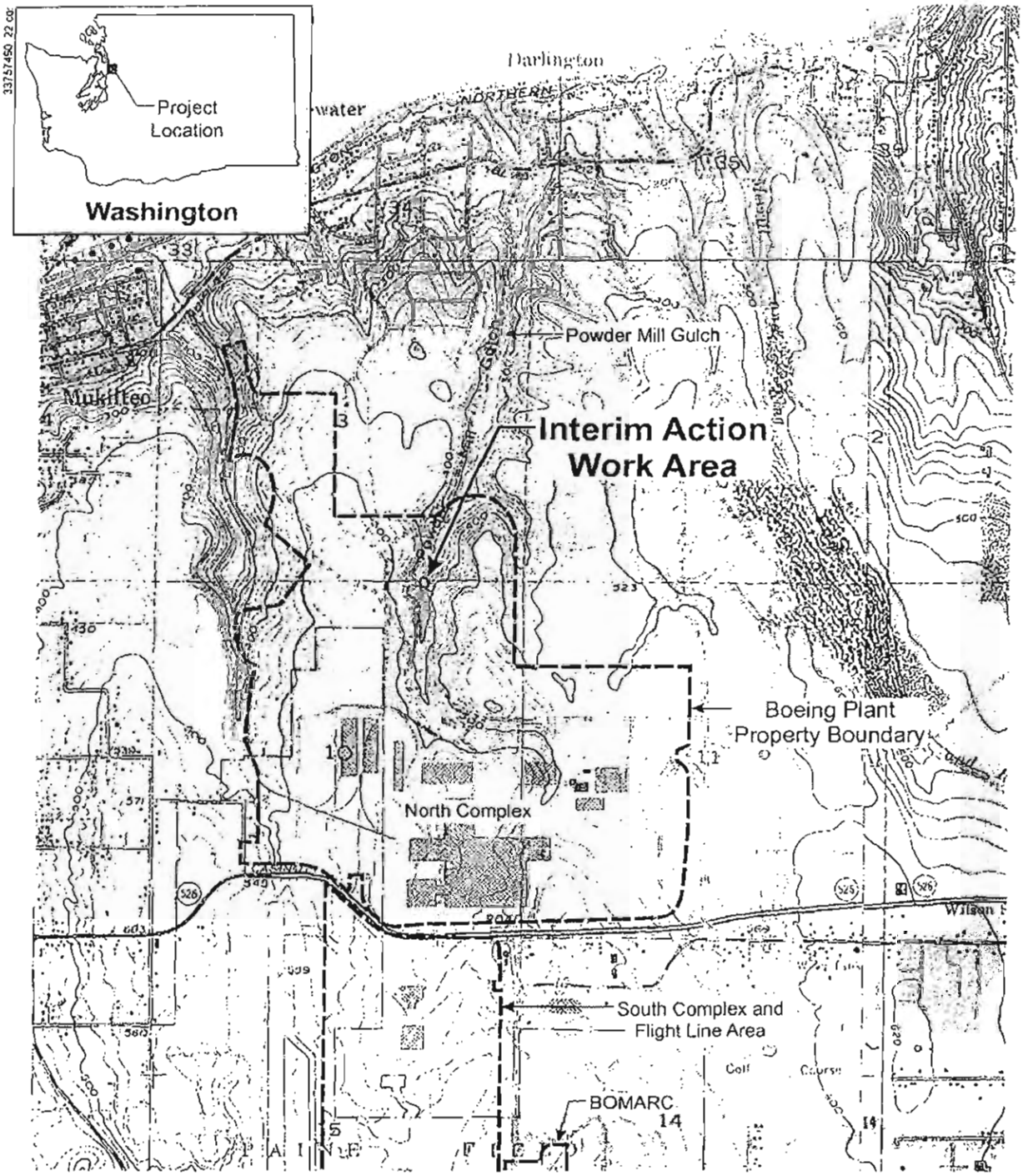
customer service survey form. This form and information about our administrative appeal process is available on our website at: www.nws.usace.army.mil/reg.html.

A copy of this letter with enclosures will be furnished to Mr. Michael Meyer, URS Corporation, 1501 4th Avenue, Suite 1400, Seattle, Washington 98101-1616. If you have any questions about this letter or our regulatory program, please contact me at (206) 764-6904 or via email at Susan.S.Glenn@usace.army.mil.

Sincerely,

Susan Glenn, Project Manager
North Application Review Section

Enclosures



Map created with TOPO!™ © 1997 Wildflower Productions, www.topo.com, based on USGS topographic map

Job No. 33757490

Figure 1
Location Map

PURPOSE: TO IMPROVE WATER QUALITY

PROPOSED: REMOVE PCB IMPACTED SEDIMENT (0.05 AC)
IN: POWDER MILL CREEK
AT: EVERETT
COUNTY: SNOHOMISH STATE: WA
APPLICATION BY: BOEING COMPANY
SHEET 1 OF 2 DATE: AUGUST 2005

REFERENCE: 200501319

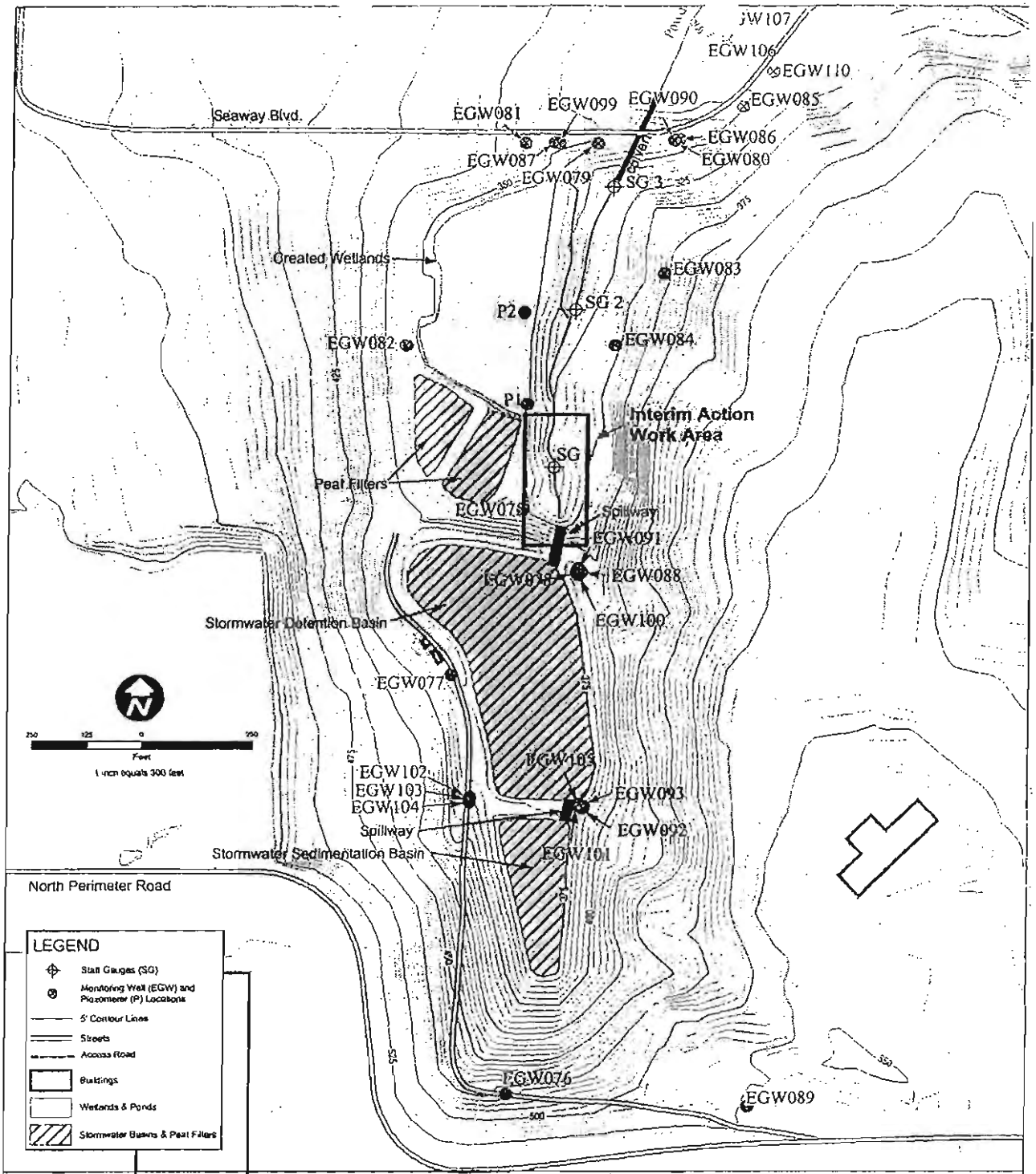


Figure 2
Area Plan

PURPOSE: TO IMPROVE WATER QUALITY

PROPOSED: REMOVE PCB IMPACTED SEDIMENT (0.05 AC).
IN: POWDER MILL CREEK
AT: EVERETT
COUNTY: SNOHOMISH STATE: WA
APPLICATION BY: BOEING COMPANY
SHEET 2 OF 2 DATE: AUGUST 2005

REFERENCE: 200501319

US Army Corps of Engineers
Seattle District

NATIONWIDE PERMIT 38
Terms and Conditions

Effective Date: March 18, 2002

In addition to any special condition that may be required on a case-by-case basis by the District Engineer, the following terms and conditions must be met, as applicable, for a Nationwide Permit 38 authorization to be valid in Washington State.

A. DESCRIPTION OF AUTHORIZED ACTIVITIES

Cleanup of Hazardous and Toxic Waste. Specific activities required to effect the containment, stabilization, or removal of hazardous or toxic waste materials that are performed, ordered, or sponsored by a government agency with established legal or regulatory authority provided the permittee notifies the District Engineer in accordance with the "Notification" General Condition. For discharges in special aquatic sites, including wetlands, the notification must also include a delineation of affected special aquatic sites, including wetlands. Court ordered remedial action plans or related settlements are also authorized by this NWP. This NWP does not authorize the establishment of new disposal sites or the expansion of existing sites used for the disposal of hazardous or toxic waste. Activities undertaken entirely on a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) site by authority of CERCLA as approved or required by EPA, are not required to obtain permits under Section 404 of the CWA or Section 10 of the Rivers and Harbors Act. (Sections 10 and 404)

B. CORPS REGIONAL CONDITIONS FOR THIS NWP

None.

C. EPA, PUYALLUP TRIBE AND CHEHALIS TRIBE WQC CONDITIONS FOR THIS NWP

EPA, Puyallup Tribe and Chehalis Tribe water quality certification (WQC) has been denied without prejudice. An individual WQC is required for all Section 404 activities..

D. State WQC Conditions for this NWP

Partially denied with out prejudice. An individual 401 Certificate is required unless authorized through a cleanup order from Ecology or EPA. An individual 401 Certification is required for all other activities.

E. STATE CZM CONSISTENCY DETERMINATION CONDITIONS FOR THIS NWP

The Coastal Zone Management (CZM) Consistency Determination has been partially denied without prejudice for this NWP. An individual CZM Consistency Response must be obtained for projects requiring individual 401 Certification and located within counties in the coastal zone.

F. CORPS NATIONAL GENERAL CONDITIONS FOR ALL NWPs

1. **Navigation**. No activity may cause more than a minimal adverse effect on navigation.

2. **Proper Maintenance**. Any structure or fill authorized shall be properly maintained, including maintenance to ensure public safety.

3. **Soil Erosion and Sediment Controls**. Appropriate soil erosion and sediment controls must be used and maintained in effective operating condition during construction, and all exposed soil and other fills, as well as any work below the ordinary high water mark or high tide line, must be permanently stabilized at the earliest practicable date. Permittees are encouraged to perform work within waters of the United States during periods of low-flow or no-flow.

4. **Aquatic Life Movements**. No activity may substantially disrupt the necessary life-cycle movements of those species of aquatic life indigenous to the waterbody, including those species that normally migrate through the area, unless the activity's primary purpose is to impound water. Culverts placed in streams must be installed to maintain low flow conditions.

5. **Equipment**. Heavy equipment working in wetlands must be placed on mats, or other measures must be taken to minimize soil disturbance.

6. **Regional and Case-By-Case Conditions**. The activity must comply with any regional conditions that may have been added by the Division Engineer (see 33 CFR 330.4(e)) and with any case specific conditions added by the Corps or by the state or tribe in its Section 401 Water Quality Certification and Coastal Zone Management Act consistency determination.

7. **Wild and Scenic Rivers**. No activity may occur in a component of the National Wild and Scenic River System; or in a river officially designated by Congress as a "study river" for possible inclusion in the system, while the river is in an official study status; unless the appropriate Federal agency, with direct management responsibility for such river, has determined in writing that the proposed activity will not adversely affect the Wild and Scenic River designation, or study status. Information on Wild and Scenic Rivers may be obtained from the appropriate Federal land management agency in the area (e.g., National Park Service, U.S. Forest Service, Bureau of Land Management, U.S. Fish and Wildlife Service).

8. **Tribal Rights**. No activity or its operation may impair reserved tribal rights, including, but not limited to, reserved water rights and treaty fishing and hunting rights.

9. **Water Quality.**

(a) In certain states and tribal lands an individual 401 Water Quality Certification must be obtained or waived (See 33 CFR 330.4(c)).

(b) For NWPs 12, 14, 17, 18, 32, 39, 40, 42, 43, and 44, where the state or tribal 401 certification (either generically or individually) does not require or approve water quality management measures, the permittee must provide water quality management measures that will ensure that the authorized work does not result in more than minimal degradation of water quality (or the Corps determines that compliance with state or local standards, where applicable, will ensure no more than minimal adverse effect on water quality). An important component of water quality management includes stormwater management that minimizes degradation of the downstream aquatic system, including water quality (refer to General Condition 21 for stormwater management requirements). Another important component of water quality management is the establishment and maintenance of vegetated buffers next to open waters, including streams (refer to General Condition 19 for vegetated buffer requirements for the NWPs). This condition is only applicable to projects that have the potential to affect water quality. While appropriate measures must be taken, in most cases it is not necessary to conduct detailed studies to identify such measures or to require monitoring.

10. **Coastal Zone Management.** In certain states, an individual state coastal zone management consistency concurrence must be obtained or waived (see 33 CFR 330.4(d)).

11. **Endangered Species.**

(a) No activity is authorized under any NWP which is likely to jeopardize the continued existence of a threatened or endangered species or a species proposed for such designation, as identified under the Federal Endangered Species Act (ESA), or which will destroy or adversely modify the critical habitat of such species. Non-federal permittees shall notify the District Engineer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, or is located in the designated critical habitat and shall not begin work on the activity until notified by the District Engineer that the requirements of the ESA have been satisfied and that the activity is authorized. For activities that may affect Federally-listed endangered or threatened species or designated critical habitat, the notification must include the name(s) of the endangered or threatened species that may be affected by the proposed work or that utilize the designated critical habitat that may be affected by the proposed work. As a result of formal or informal consultation with the FWS or NMFS the District Engineer may add species-specific regional endangered species conditions to the NWPs.

(b) Authorization of an activity by a NWP does not authorize the "take" of a threatened or endangered species as defined under the ESA. In the absence of separate authorization (e.g., an ESA Section 10 Permit, a Biological Opinion with "incidental take" provisions, etc.) from the USFWS or the NMFS, both lethal and non-lethal "takes" of protected species are in violation of the ESA. Information on the location of threatened and endangered species and their critical habitat can be obtained directly from the offices of the USFWS and NMFS or their world wide web pages at *http://www.fws.gov/r9endspp/endspp.html* and *http://www.nmfs.noaa.gov/prot_res/overview/es.html* respectively.

12. **Historic Properties.** No activity which may affect historic properties listed, or eligible for listing, in the National Register of Historic Places is authorized, until the District Engineer has complied with the provisions of 33 CFR part 325, Appendix C. The prospective permittee must notify the District Engineer if the authorized activity may affect any historic properties listed, determined to be eligible, or which the prospective permittee has reason to believe may be eligible for listing on the National Register of Historic Places, and shall not begin the activity until notified by the District Engineer that the requirements of the National Historic Preservation Act have been satisfied and that the activity is authorized. Information on the location and existence of historic resources can be obtained from the State Historic Preservation Office and the National Register of Historic Places (see 33 CFR 330.4(g)). For activities that may affect historic properties listed in, or eligible for listing in, the National Register of Historic Places, the notification must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property.

13. **Notification.**

(a) **Timing**: Where required by the terms of the NWP, the prospective permittee must notify the District Engineer with a preconstruction notification (PCN) as early as possible. The District Engineer must determine if the notification is complete within 30 days of the date of receipt and can request additional information necessary to make the PCN complete only once. However, if the prospective permittee does not provide all of the requested information, then the District Engineer will notify the prospective permittee that the notification is still incomplete and the PCN review process will not commence until all of the requested information has been received by the District Engineer. The prospective permittee shall not begin the activity:

(1) Until notified in writing by the District Engineer that the activity may proceed under the NWP with any special conditions imposed by the District or Division Engineer; or

(2) If notified in writing by the District or Division Engineer that an Individual Permit is required; or

(3) Unless 45 days have passed from the District Engineer's receipt of the complete notification and the prospective permittee has not received written notice from the District or Division Engineer. Subsequently, the permittee's right to proceed under the NWP may be modified, suspended, or revoked only in accordance with the procedure set forth in 33 CFR 330.5(d)(2).

(b) **Contents of Notification**: The notification must be in writing and include the following information:

(1) Name, address and telephone numbers of the prospective permittee;

(2) Location of the proposed project;

(3) Brief description of the proposed project; the project's purpose; direct and indirect adverse environmental effects the project would cause; any other NWP(s), Regional General Permit(s), or Individual Permit(s) used or intended to be used to authorize any part of the proposed project or any related activity. Sketches should be provided when necessary to show that the activity complies with the terms of the NWP (Sketches usually clarify the project and when provided result in a quicker decision.);

(4) For NWPs 7, 12, 14, 18, 21, 34, 38, 39, 40, 41, 42, and 43, the PCN must also include a delineation of affected special aquatic sites, including wetlands, vegetated shallows (e.g., submerged aquatic vegetation, seagrass beds), and riffle and pool complexes (see paragraph 13(f));

(5) For NWP 7 (Outfall Structures and Maintenance), the PCN must include information regarding the original design capacities and configurations of those areas of the facility where maintenance dredging or excavation is proposed;

(6) For NWP 14 (Linear Transportation Projects), the PCN must include a compensatory mitigation proposal to offset permanent losses of waters of the US and a statement describing how temporary losses of waters of the US will be minimized to the maximum extent practicable;

(7) For NWP 21 (Surface Coal Mining Activities), the PCN must include an Office of Surface Mining (OSM) or state-approved mitigation plan, if applicable. To be authorized by this NWP, the District Engineer must determine that the activity complies with the terms and conditions of the NWP and that the adverse environmental effects are minimal both individually and cumulatively and must notify the project sponsor of this determination in writing;

(8) For NWP 27 (Stream and Wetland Restoration Activities), the PCN must include documentation of the prior condition of the site that will be reverted by the permittee;

(9) For NWP 29 (Single-Family Housing), the PCN must also include:

(i) Any past use of this NWP by the Individual Permittee and/or the permittee's spouse;

(ii) A statement that the single-family housing activity is for a personal residence of the permittee;

(iii) A description of the entire parcel, including its size, and a delineation of wetlands. For the purpose of this NWP, parcels of land measuring 1/4-acre or less will not require a formal on-site delineation. However, the applicant shall provide an indication of where the wetlands are and the amount of wetlands that exists on the property. For parcels greater than 1/4-acre in size, formal wetland delineation must be prepared in accordance with the current method required by the Corps. (See paragraph 13(f));

(iv) A written description of all land (including, if available, legal descriptions) owned by the prospective permittee and/or the prospective permittee's spouse, within a one mile radius of the parcel, in any form of ownership (including any land owned as a partner, corporation, joint tenant, co-tenant, or as a tenant-by-the-entirety) and any land on which a purchase and sale agreement or other contract for sale or purchase has been executed;

(10) For NWP 31 (Maintenance of Existing Flood Control Facilities), the prospective permittee must either notify the District Engineer with a PCN prior to each maintenance activity or submit a five year (or less) maintenance plan. In addition, the PCN must include all of the following:

(i) Sufficient baseline information identifying the approved channel depths and configurations and existing facilities. Minor deviations are authorized, provided the approved flood control protection or drainage is not increased;

(ii) A delineation of any affected special aquatic sites, including wetlands; and,

(iii) Location of the dredged material disposal site;

(11) For NWP 33 (Temporary Construction, Access, and Dewatering), the PCN must also include a restoration plan of reasonable measures to avoid and minimize adverse effects to aquatic resources;

(12) For NWPs 39, 43 and 44, the PCN must also include a written statement to the District Engineer explaining how avoidance and minimization for losses of waters of the US were achieved on the project site;

(13) For NWP 39 and NWP 42, the PCN must include a compensatory mitigation proposal to offset losses of waters of the US or justification explaining why compensatory mitigation should not be required. For discharges that cause the loss of greater than 300 linear feet of an intermittent stream bed, to be authorized, the District Engineer must determine that the activity complies with the other terms and conditions of the NWP, determine adverse environmental effects are minimal both individually and cumulatively, and waive the limitation on stream impacts in writing before the permittee may proceed;

(14) For NWP 40 (Agricultural Activities), the PCN must include a compensatory mitigation proposal to offset losses of waters of the US. This NWP does not authorize the relocation of greater than 300 linear-feet of existing serviceable drainage ditches constructed in non-tidal streams unless, for drainage ditches constructed in intermittent non-tidal streams, the District Engineer waives this criterion in writing, and the District Engineer has determined that the project complies with all terms and conditions of this NWP, and that any adverse impacts of the project on the aquatic environment are minimal, both individually and cumulatively;

(15) For NWP 43 (Stormwater Management Facilities), the PCN must include, for the construction of new stormwater management facilities, a maintenance plan (in accordance with state and local requirements, if applicable) and a compensatory mitigation proposal to offset losses of waters of the US. For discharges that cause the loss of greater than 300 linear feet of an intermittent stream bed, to be authorized, the District Engineer must determine that the activity complies with the other terms and conditions of the NWP, determine adverse environmental effects are minimal both individually and cumulatively, and waive the limitation on stream impacts in writing before the permittee may proceed;

(16) For NWP 44 (Mining Activities), the PCN must include a description of all waters of the US adversely affected by the project, a description of measures taken to minimize adverse effects to waters of the US, a description of measures taken to comply with the criteria of the NWP, and a reclamation plan (for all aggregate mining activities in isolated waters and non-tidal wetlands adjacent to headwaters and any hard rock/mineral mining activities);

(17) For activities that may adversely affect Federally-listed endangered or threatened species, the PCN must include the name(s) of those endangered or threatened species that may be affected by the proposed work or utilize the designated critical habitat that may be affected by the proposed work; and

(18) For activities that may affect historic properties listed in, or eligible for listing in, the National Register of Historic Places, the PCN must state which historic property may be affected by the proposed work or include a vicinity map indicating the location of the historic property.

(c) **Form of Notification**: The standard Individual Permit application form (Form ENG 4345) may be used as the notification but must clearly indicate that it is a PCN and must include all of the information required in (b) (1)-(18) of General Condition 13. A letter containing the requisite information may also be used.

(d) **District Engineer's Decision**: In reviewing the PCN for the proposed activity, the District Engineer will determine whether the activity authorized by the NWP will result in more than minimal individual or cumulative adverse environmental effects or may be contrary to the public interest. The prospective permittee may submit a proposed mitigation plan with the PCN to expedite the process. The District Engineer will consider any proposed compensatory mitigation the applicant has included in the proposal in determining whether the net adverse environmental effects to the aquatic environment of the proposed work are minimal. If the District Engineer determines that the activity complies with the terms and conditions of the NWP and that the adverse effects on the aquatic environment are minimal, after considering mitigation, the District Engineer will notify the permittee and include any conditions the District Engineer deems necessary. The District Engineer must approve any compensatory mitigation proposal before the permittee commences work. If the prospective permittee is required to submit a compensatory mitigation proposal with the PCN, the proposal may be either conceptual or detailed. If the prospective permittee elects to submit a compensatory mitigation plan with the PCN, the District Engineer will expeditiously review the proposed compensatory mitigation plan. The District Engineer must review the plan within 45 days of receiving a complete PCN and determine whether the conceptual or specific proposed mitigation would ensure no more than minimal adverse effects on the aquatic environment. If the net adverse effects of the project on the aquatic environment (after consideration of the compensatory mitigation proposal) are determined by the District Engineer to be minimal, the District Engineer will provide a timely written response to the applicant. The response will state that the project can proceed under the terms and conditions of the NWP. If the District Engineer determines that the adverse effects of the proposed work are more than minimal, then the District Engineer will notify the applicant either: (1) That the project does not qualify for authorization under the NWP and instruct the applicant on the procedures to seek authorization under an Individual Permit; (2) that the project is authorized under the NWP subject to the applicant's submission of a mitigation proposal that would reduce the adverse effects on the aquatic environment to the minimal level; or (3) that the project is authorized under the NWP with specific modifications or conditions. Where the District Engineer determines that mitigation is required to ensure no more than minimal adverse effects occur to the aquatic environment, the activity will be authorized within the 45-day PCN period. The authorization will include the necessary conceptual or specific mitigation or a requirement that the applicant submit a mitigation proposal that would reduce the adverse effects on the aquatic environment to the minimal level. When conceptual mitigation is included, or a mitigation plan is required under item (2) above, no work in waters of the US will occur until the District Engineer has approved a specific mitigation plan.

(e) **Agency Coordination**: The District Engineer will consider any comments from Federal and state agencies concerning the proposed activity's compliance with the terms and conditions of the NWPs and the need for mitigation to reduce the project's adverse environmental effects to a minimal level. For activities requiring notification to the District Engineer that result in the loss of greater than 1/2-acre of waters of the US, the District Engineer will provide immediately (e.g., via facsimile transmission, overnight mail, or other expeditious manner) a copy to the appropriate Federal or state offices (USFWS, state natural resource or water quality agency, EPA, State Historic Preservation Officer (SHPO), and, if appropriate, the NMFS). With the exception of NWP 37, these agencies will then have 10 calendar days from the date the material is transmitted to telephone or fax the District Engineer notice that they intend to provide substantive, site-specific comments. If so contacted by an agency, the District Engineer will wait an additional 15 calendar days before making a decision on the notification. The District Engineer will fully consider agency comments received within the specified time frame, but will provide no response to the resource agency, except as provided below. The District Engineer will indicate in the administrative record associated with each notification that the resource agencies' concerns were considered. As required by section 305(b)(4)(B) of the Magnuson-Stevens

Fishery Conservation and Management Act, the District Engineer will provide a response to NMFS within 30 days of receipt of any Essential Fish Habitat conservation recommendations. Applicants are encouraged to provide the Corps multiple copies of notifications to expedite agency notification.

(f) **Wetland Delineations**: Wetland delineations must be prepared in accordance with the current method required by the Corps (For NWP 29 see paragraph (b)(9)(iii) for parcels less than (1/4-acre in size). The permittee may ask the Corps to delineate the special aquatic site. There may be some delay if the Corps does the delineation. Furthermore, the 45-day period will not start until the wetland delineation has been completed and submitted to the Corps, where appropriate.

14. **Compliance Certification**. Every permittee who has received NWP verification from the Corps will submit a signed certification regarding the completed work and any required mitigation. The certification will be forwarded by the Corps with the authorization letter and will include:

(a) A statement that the authorized work was done in accordance with the Corps authorization, including any general or specific conditions;

(b) A statement that any required mitigation was completed in accordance with the permit conditions; and

(c) The signature of the permittee certifying the completion of the work and mitigation.

15. **Use of Multiple Nationwide Permits**. The use of more than one NWP for a single and complete project is prohibited, except when the acreage loss of waters of the US authorized by the NWPs does not exceed the acreage limit of the NWP with the highest specified acreage limit (e.g. if a road crossing over tidal waters is constructed under NWP 14, with associated bank stabilization authorized by NWP 13, the maximum acreage loss of waters of the US for the total project cannot exceed 1/3-acre).

16. **Water Supply Intakes**. No activity, including structures and work in navigable waters of the US or discharges of dredged or fill material, may occur in the proximity of a public water supply intake except where the activity is for repair of the public water supply intake structures or adjacent bank stabilization.

17. **Shellfish Beds**. No activity, including structures and work in navigable waters of the US or discharges of dredged or fill material, may occur in areas of concentrated shellfish populations, unless the activity is directly related to a shellfish harvesting activity authorized by NWP 4.

18. **Suitable Material.** No activity, including structures and work in navigable waters of the US or discharges of dredged or fill material, may consist of unsuitable material (e.g., trash, debris, car bodies, asphalt, etc.) and material used for construction or discharged must be free from toxic pollutants in toxic amounts (see section 307 of the CWA).

19. **Mitigation**. The District Engineer will consider the factors discussed below when determining the acceptability of appropriate and practicable mitigation necessary to offset adverse effects on the aquatic environment that are more than minimal.

(a) The project must be designed and constructed to avoid and minimize adverse effects to waters of the US to the maximum extent practicable at the project site (i.e., on site).

(b) Mitigation in all its forms (avoiding, minimizing, rectifying, reducing or compensating) will be required to the extent necessary to ensure that the adverse effects to the aquatic environment are minimal.

(c) Compensatory mitigation at a minimum one-for-one ratio will be required for all wetland impacts requiring a PCN, unless the District Engineer determines in writing that some other form of mitigation would be more environmentally appropriate and provides a project-specific waiver of this requirement. Consistent with National policy, the District Engineer will establish a preference for restoration of wetlands as compensatory mitigation, with preservation used only in exceptional circumstances.

(d) Compensatory mitigation (i.e., replacement or substitution of aquatic resources for those impacted) will not be used to increase the acreage losses allowed by the acreage limits of some of the NWPs. For example, 1/4-acre of wetlands cannot be created to change a 3/4-acre loss of wetlands to a 1/2-acre loss associated with NWP 39 verification. However, 1/2-acre of created wetlands can be used to reduce the impacts of a 1/2-acre loss of wetlands to the minimum impact level in order to meet the minimal impact requirement associated with NWPs.

(e) To be practicable, the mitigation must be available and capable of being done considering costs, existing technology, and logistics in light of the overall project purposes. Examples of mitigation that may be appropriate and practicable include, but are not limited to: reducing the size of the project; establishing and maintaining wetland or upland vegetated buffers to protect open waters such as streams; and replacing losses of aquatic resource functions and values by creating, restoring, enhancing, or preserving similar functions and values, preferably in the same watershed.

(f) Compensatory mitigation plans for projects in or near streams or other open waters will normally include a requirement for the establishment, maintenance, and legal protection (e.g., easements, deed restrictions) of vegetated buffers to open waters. In many cases, vegetated buffers will be the only compensatory mitigation required. Vegetated buffers should consist of native species. The width of the vegetated buffers required will address documented water quality or aquatic habitat loss concerns. Normally, the vegetated buffer will be 25 to 50 feet wide on each side of the stream, but the District Engineers may require slightly wider vegetated buffers to address documented water quality or habitat loss concerns. Where both wetlands and open waters exist on the project site, the Corps will determine the appropriate compensatory mitigation (e.g., stream buffers or wetlands compensation) based on what is best for the aquatic environment on a watershed basis. In cases where vegetated buffers are determined to be the most appropriate form of compensatory mitigation, the District Engineer may waive or reduce the requirement to provide wetland compensatory mitigation for wetland impacts.

(g) Compensatory mitigation proposals submitted with the "notification" may be either conceptual or detailed. If conceptual plans are approved under the verification, then the Corps will condition the verification to require detailed plans be submitted and approved by the Corps prior to construction of the authorized activity in waters of the US.

(h) Permittees may propose the use of mitigation banks, in-lieu fee arrangements or separate activity-specific compensatory mitigation. In all cases that require compensatory mitigation, the mitigation provisions will specify the party responsible for accomplishing and/or complying with the mitigation plan.

20. **Spawning Areas**. Activities, including structures and work in navigable waters of the US or discharges of dredged or fill material, in spawning areas during spawning seasons must be avoided to the maximum extent practicable. Activities that result in the physical destruction (e.g., excavate, fill, or smother downstream by substantial turbidity) of an important spawning area are not authorized.

21. **Management of Water Flows**. To the maximum extent practicable, the activity must be designed to maintain preconstruction downstream flow conditions (e.g., location, capacity, and flow rates). Furthermore, the activity must not permanently restrict or impede the passage of normal or expected high flows (unless the primary purpose of the fill is to impound waters) and the structure or discharge of dredged or fill material must withstand expected high flows. The activity must, to the maximum extent practicable, provide for retaining excess flows from the site, provide for maintaining surface flow rates from the site similar to preconstruction conditions, and provide for not increasing water flows from the project site, relocating water, or redirecting water flow beyond preconstruction conditions. Stream channelizing will be reduced to the minimal amount necessary, and the activity must, to the maximum extent practicable, reduce adverse effects such as flooding or erosion downstream and upstream of the project site, unless the activity is part of a larger system designed to manage water flows. In most cases, it will not be a requirement to conduct detailed studies and monitoring of water flow. This condition is only applicable to projects that have the potential to affect waterflows. While appropriate measures must be taken, it is not necessary to conduct detailed studies to identify such measures or require monitoring to ensure their effectiveness. Normally, the Corps will defer to state and local authorities regarding management of water flow.

22. **Adverse Effects From Impoundments**. If the activity creates an impoundment of water, adverse effects to the aquatic system due to the acceleration of the passage of water, and/or the restricting its flow shall be minimized to the maximum extent practicable. This includes structures and work in navigable waters of the US, or discharges of dredged or fill material.

23. **Waterfowl Breeding Areas**. Activities, including structures and work in navigable waters of the US or discharges of dredged or fill material, into breeding areas for migratory waterfowl must be avoided to the maximum extent practicable.

24. **Removal of Temporary Fills**. Any temporary fills must be removed in their entirety and the affected areas returned to their preexisting elevation.

25. **Designated Critical Resource Waters**. Critical resource waters include, NOAA-designated marine sanctuaries, National Estuarine Research Reserves, National Wild and Scenic Rivers, critical habitat for Federally listed threatened and endangered species, coral reefs, state natural heritage sites, and outstanding national resource waters or other waters officially designated by a state as having particular environmental or ecological significance and identified by the District Engineer after notice and opportunity for public comment. The District Engineer may also designate additional critical resource waters after notice and opportunity for comment.

(a) Except as noted below, discharges of dredged or fill material into waters of the US are not authorized by NWPs 7, 12, 14, 16, 17, 21, 29, 31, 35, 39, 40, 42, 43, and 44 for any activity within, or directly affecting, critical resource waters, including wetlands adjacent to such waters. Discharges of dredged or fill materials into waters of the US may be authorized by the above NWPs in National Wild and Scenic Rivers if the activity complies with General Condition 7. Further, such discharges may be authorized in designated critical habitat for Federally listed threatened or endangered species if the activity complies with General Condition 11 and the USFWS or the NMFS has concurred in a determination of compliance with this condition.

(b) For NWPs 3, 8, 10, 13, 15, 18, 19, 22, 23, 25, 27, 28, 30, 33, 34, 36, 37, and 38, notification is required in accordance with General Condition 13, for any activity proposed in the designated critical resource waters including wetlands adjacent to those waters. The District Engineer may authorize activities under these NWPs only after it is determined that the impacts to the critical resource waters will be no more than minimal.

26. **Fills Within 100-Year Floodplains**. For purposes of this General Condition, 100-year floodplains will be identified through the existing Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps or FEMA-approved local floodplain maps.

(a) Discharges in Floodplain; Below Headwaters. Discharges of dredged or fill material into waters of the US within the mapped 100-year floodplain, below headwaters (i.e., 5 cfs), resulting in permanent above-grade fills, are not authorized by NWPs 39, 40, 42, 43, and 44.

(b) Discharges in Floodway; Above Headwaters. Discharges of dredged or fill material into waters of the US within the FEMA or locally mapped floodway, resulting in permanent above-grade fills, are not authorized by NWPs 39, 40, 42, and 44.

(c) The permittee must comply with any applicable FEMA-approved state or local floodplain management requirements.

27. **Construction Period**. For activities that have not been verified by the Corps and the project was commenced or under contract to commence by the expiration date of the NWP (or modification or revocation date), the work must be completed within 12-months after such date (including any modification that affects the project). For activities that have been verified and the project was commenced or under contract to commence within the verification period, the work must be completed by the date determined by the Corps. For projects that have been verified by the Corps, an extension of a Corps approved completion date maybe requested. This request must be submitted at least one month before the previously approved completion date.

G. CORPS REGIONAL GENERAL CONDITIONS FOR ALL NWPs

1. **Mature Forested and Bog and Bog-like Wetlands**. The use of NWPs is specifically prohibited in mature forested wetlands or bog and bog-like wetlands or just these components of a wetland system (as defined in the Definition section of this Public Notice), except for projects provided coverage under the following NWPs:

NWP 3(i,ii) – Maintenance
NWP 20 – Oil Spill Cleanup
NWP 32 – Completed Enforcement Actions
NWP 38 – Cleanup of Hazardous and Toxic Waste
NWP 40(a) – USDA program participant

NOTE: NWP regulations do not allow the regional conditioning of NWP 40(a).

2. **Access.** You must allow representatives from this office to inspect the authorized activity at any time deemed necessary to ensure that it is being, or has been, accomplished in accordance with the terms and conditions of your permit.

3. **Commencement Bay.** An individual permit is required in the Commencement Bay Study Area (CBSA) for activities which would have qualified for the following NWPs:

NWP 12 – Utility Line Activities (substations and access roads)
NWP 13 – Bank Stabilization
NWP 14 – Linear Transportation Crossings
NWP 23 – Approved Categorical Exclusions
NWP 29 – Single-Family Housing
NWP 39 – Residential, Commercial, and Institutional Developments
NWP 40 – Agricultural Activities
NWP 41 – Reshaping Existing Drainage Ditches
NWP 42 – Recreational Facilities
NWP 43 – Stormwater Management Facilities

The CBSA is located near the southern end of Puget Sound's main basin at Tacoma, Pierce County, Washington. The CBSA extends from Brown's Point around the bay to Point Defiance and includes the commercial waterways, wetlands, and any other jurisdictional waters. From Point Defiance, the line runs southeast to State Route 7 (Pacific Avenue), then south to the centerline of I-5; then east (northbound lanes) along I-5 to the Puyallup River. The boundary extends 200 feet on either side of the Puyallup River southeast to the Clark Creek Road (Melroy) Bridge. From the Puyallup River, the boundary extends east along I-5 to 70th Avenue E. The line then returns to Brown's Point to the northwest, following the 100-foot contour elevation above sea level located east of Hylebos Creek and Marine View Drive.

4. **Mill Creek Special Area Management Plan (SAMP).** Within the boundaries of the (SAMP), the following NWPs can be used only in those areas designated as "Developable Wetlands":

NWP 14 – Linear Transportation Crossings
NWP 23 – Approved Categorical Exclusions
NWP 29 – Single-Family Housing
NWP 33 – Temporary Construction, Access and Dewatering
NWP 39 – Residential, Commercial, and Institutional Developments
NWP 40 – Agricultural Activities
NWP 41 – Reshaping Existing Drainage Ditches
NWP 42 – Recreational Facilities
NWP 43 – Stormwater Management Facilities

Until the SAMP is approved, the users of these NWPs listed above (except NWP 40a.) must notify the District Engineer in accordance with General Condition 13 for any acreage or volume proposed. Once the SAMP is approved, the "Notification" limits will be as specified in the individual NWPs.

Mitigation requirements for these projects must either be onsite or within the areas designated as "Preferred Mitigation Sites". Mitigation plans must comply with the requirements found within the Mill Creek Special Area Management Plan, King County, Washington, dated April 2000.

An individual permit is required for all proposals in "Developable Wetlands" that would have qualified for NWPs other than those listed above.

NWP 27, Stream Restoration and Enhancement Activities, can be used within the SAMP, but, must comply with the requirements found within the Mill Creek Special Area Management Plan, King County, Washington.

The Mill Creek SAMP applies to all areas and tributaries drained by Mill Creek (Auburn), Mullen Slough, Midway Creek, Auburn Creek, and the area bounded by 4th Street Northeast in Auburn on the south, and the Ordinary High Water mark of the Green River on the east and north.

5. **Prohibited Work Times for Bald Eagle Protection**. For compliance with National General Condition 11, the following construction activity prohibitions apply to protect bald eagles, listed as threatened under the Endangered Species Act:

(a) No construction activity authorized under a NWP shall occur within 1/4 mile of an occupied bald eagle nest, nocturnal roost site, or wintering concentration area, within the following seasonal work prohibition times.

(b) No construction activity authorized under a NWP shall occur within 1/2 mile BY LINE OF SIGHT of an occupied bald eagle nest or nocturnal roost site, within the following seasonal work prohibition times:

Work prohibition times:

(1) Nesting between January 1 and August 15 each year.
(2) Wintering areas between November 1 and March 31 each year.

Exceptions to these prohibited work times can be made by request to the Corps and approved by the U.S. Fish and Wildlife Service (USFWS).

Contact the USFWS to determine if a bald eagle nest, nocturnal roost, or wintering concentration occurs near your proposed project:

West of Cascades: Olympia Office – (360) 753-9440
East of Cascades: Ephrata – (509) 754-8580 or Spokane – (509) 893-8002
Mainstem of the Columbia River downstream from McNary Dam: Portland – (503) 231-6179

H. ADDITIONAL LIMITATIONS ON THE USE OF NWPs

1. District Engineers have authority to determine if an activity complies with the terms and conditions of an NWP.

2. NWPs do not obviate the need to obtain other Federal, state, or local permits, approvals, or authorizations required by law.

3. NWPs do not grant any property rights or exclusive privileges.

4. NWPs do not authorize any injury to the property or rights of others.

5. NWPs do not authorize interference with any existing or proposed Federal project.

6. If future operations by the United States require the removal, relocation, or other alteration of the work herein authorized, or if, in the opinion of the Secretary of the Army or his authorized representative, said structure or work shall cause unreasonable obstruction to the free navigation of the navigable waters, you will be required, upon due notice from the U. S Army Corps of Engineers, to remove, relocate, or alter the structural work or obstructions caused thereby, without expense to the United States. No claim shall be made against the United States on account of any such removal or alteration.

I. FURTHER INFORMATION

Further information about the U.S. Army Corps of Engineers regulatory program, including nationwide permits, may also be accessed on our Internet page: ***http://www.nws.usace.army.mil*** (select "Regulatory/Permits").

State of Washington

Department of Fish and Wildlife

Mailing Address: Region 4 Office: 16018 Mill Creek Boulevard - Mill Creek Washington 98012 (425) 775-1311

December 7, 2005

URS Corporation
Michael T. Meyer
1501 4th Ave, Suite 1400
Seattle, WA 98101-1616

Dear Mr. Meyer:

SUBJECT: Powder Mill Creek Interim Action; Powder Mill Creek; Section 3, Township 28North, Range 4East, Snohomish County, WRIA 07.1727

Thank you for the opportunity to comment on the PCB sediment removal in Powder Mill Creek. It is my understanding that this work will be conducted under the Washington State Model Toxics Control Act (MTCA) Program. Under the MTCA, this project is exempt from the Hydraulic Project Approval (HPA) permit. However, the Washington Department of Fish and Wildlife (WDFW) requests that the technical provisions from WAC 220-110 be followed to protect fish life.

Portions of the following WAC's specifically apply to this project:

WAC 220-110-120 Temporary Bypass Culvert, Flume, or Channel.

Temporary bypass culvert, flume, or channel projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat. The following technical provisions shall apply to temporary bypass culvert, flume, or channel projects:

(1) The temporary bypass culvert, flume, or channel shall be in place prior to initiation of other work in the wetted perimeter.

(2) A sandbag revetment or similar device shall be installed at the inlet to divert the entire flow through the culvert, flume, or channel.

(3) A sandbag revetment or similar device shall be installed at the downstream end of the culvert, flume, or channel to prevent backwater from entering the work area.

(4) The culvert, flume, or channel shall be of sufficient size to pass flows and debris for the duration of the project.

(6) Prior to releasing the water flow to the project area, all bank protection or armoring shall be completed.

(7) Upon completion of the project, all material used in the temporary bypass shall be removed from the site and the site returned to preproject conditions.

(8) If fish may be adversely impacted as a result of this project, the permittee shall be required to capture and safely move game and food fish and other fish life, (at the discretion of the department), from the job site to the nearest free-flowing water. The permittee may request the department to assist in capturing and safely moving fish life from the job site to free-flowing water, and assistance may be granted if personnel are available.

(9) Alteration or disturbance of the banks and bank vegetation shall be limited to that necessary to construct the project. All disturbed areas shall be protected from erosion, within seven days of completion of the project, using vegetation or other means. The banks shall be revegetated within one year with native or other approved woody species. Vegetative cuttings shall be planted at a maximum interval of three feet (on center), and maintained as necessary for three years to ensure eighty percent survival. Where proposed, planting densities and maintenance requirements for rooted stock will be determined on a site-specific basis. The requirement to plant woody vegetation may be waived for areas where the potential for natural revegetation is adequate, or where other engineering or safety factors preclude them.

WAC 220-110-130 Dredging In Freshwater Areas.

Dredging projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat. The following technical provisions shall apply to dredging projects:

(1) Dredging shall not be conducted in fish spawning areas unless it is designed to create or improve the access or quality of fish spawning areas.

(4) Dredging shall be conducted with dredge types and methods that cause the least adverse impact to fish and shellfish and their habitat.

(8) Upon completion of the dredging, the bed shall not contain pits, potholes, or large depressions to avoid stranding of fish.

WAC 220-110-080 Channel Change/Realignment.

Channel changes/realignments are generally discouraged, and shall only be approved where the applicant can demonstrate benefits or lack of adverse impact to fish life. Channel change/realignment projects shall incorporate mitigation measures as necessary to achieve no-net-loss of productive capacity of fish and shellfish habitat. The following technical provisions shall apply to channel change and channel realignment projects:

(1) Permanent new channels shall, at a minimum, be similar in length, width, depth, floodplain configuration, and gradient, as the old channel. The new channel shall incorporate fish habitat components, bed materials, meander configuration, and native or other approved vegetation equivalent to or greater than that which previously existed in the old channel.

(a) Approved fish habitat components, bed materials and bank protection to prevent erosion shall be in place.

(b) Approved fish habitat components shall be installed according to an approved design to withstand the 100-year peak flows.

(4) All disturbed areas shall be protected from erosion, within seven days of completion of the project, using vegetation or other means. The banks shall be revegetated within one year with native or other approved woody species. Vegetative cuttings shall be planted at a maximum interval of three feet (on center), and maintained as necessary for three years to ensure eighty percent survival. Where proposed, planting densities and maintenance requirements for rooted stock will be determined on a site-specific basis. The requirement to plant woody vegetation may be waived for areas where the potential for natural revegetation is adequate, or where other engineering or safety factors preclude them.

In addition to the general Best Management Practices (BMP) presented in your documentation, the following custom provisions would also apply to this project:

NOTIFICATION REQUIREMENT: The Area Habitat Biologist listed below shall be contacted by phone or e-mail (holsegh@dfw.wa.gov) within seven days of completion of work to arrange for a compliance inspection.

The dredging shall be conducted in the dry or isolation from the stream flow by the installation of a bypass flume or culvert, or by pumping the stream flow around the work area. Care shall be taken so that the stream below the project area is never dewatered. At least half the flow of the stream shall be maintained in the downstream reach at all times.

Following the dredging of the stream, appropriate fish-mix gravel must be used to line the exposed bottom of the stream channel.

Woody debris shall be placed in a manner which causes the least amount of disturbance to the streambed.

Woody debris may be placed by hand or by equipment stationed on the bank. All soils disturbed and exposed by equipment shall be given a temporary erosion control treatment (seeding, mulching, etc.) as needed prior to other plantings in the buffer.

The woody debris shall be of fir, cedar, or other approved coniferous species.

At least half of the large woody debris shall be placed so it is within the low flow channel.

If excessive clouding of the water occurs upon reintroduction of the stream flow to the dredged area, the stream flow must be reintroduced in stages. Once the dredged area has filled with water, the stream flow must again be diverted around the work area in order to allow sediments to settle. Once settling has occurred, the stream flow may be returned to its original course.

Thank you for the opportunity to provide this information. If you have any questions, please contact me at 425-379-2305.

Sincerely,

Ginger Holser
Area Habitat Biologist

GH:gh

cc: Dean Yasuda, Department of Ecology

PUBLIC WORKS
EVERETT

To: Michael Meyer

FAX: 866/495-5288

Date: February 14, 2006

From: Gene D. Bennett

FAX: 425/257-8243

Voice: 425/257-8249

RE: Analyses needed

Michael,

Here is a list of the constituents that we need the wastewater characterized for and the associated limits:

(All metals are Total)	
Arsenic	0.5 mg/L
Cadmium	0.24 "
Chromium	5.0 "
Copper	3.0 "
Lead	1.89 "
Mercury	0.1 "
Nickel	2.83 "
Silver	0.49 "
Zinc	4.0 "
pH	5.0-10.0 s.u.
Closed Cup Flashpoint	Minimum 140° F

If you have any questions feel free to give me a call.

Thank you,

1 page(s) including cover sheet

"Gene Bennett"
<GBennett@ci.everett.wa.us
>

02/24/2006 09:34 AM

To <michael_meyer@urscorp.com>
cc "Jeff Kerwin" <JKerwin@ci.everett.wa.us>
bcc
Subject Limit compliance

History: This message has been replied to.

Michael,

I have received and reviewed the data from the Powder Mill Creek sediment removal project and have determined that the contaminants in the water to be discharged at the level you have characterized them will not violate the City's Local Limits or cause pass-through or interference in the Everett POTW.

Upon receipt of a request for a Discharge Authorization, I see no impediment to issuing one to authorize the discharge to the Everett POTW.

Gene D. Bennett
Industrial Waste Inspector
City of Everett
425/257-8240
gbennett at ci.everett.wa.us

URS

Facsimile

To: Gene D. Bennett

Firm: Everett Public Works

Facsimile: 425.257.8243

From: Michael Meyer

Date: February 23, 2006

Page 1 of : 2

Subject: Concurrence on discharge limits and non-interference for construction dewatering water at Boeing Everett during Powder Mill Creek sediment removal

Message: Gene,

We need to clearly demonstrate to Ecology that our handling and treatment of construction dewatering water from the Powder Mill Creek sediment removal project will meet your discharge requirements and not interfere with your treatment process. To that end I've created the attached table that summarizes the expected contaminant concentrations in influent water and the treatment goals. I would appreciate your review of the table.

If you concur that we are using the appropriate pre-treatment goals and that the expected concentrations will not interfere with your process, could you please respond in writing to that effect? An email or FAX is fine.

We currently plan to filter the water to remove suspended solids and we will be sampling each batch of water prior to discharge.

Thanks for your help on this. I can be reached at 206.438.2226 or by email at michael_meyer@urscorp.com.

Sincerely,

Michael Meyer

cc:

URS Corporation
1501 4th Avenue, Suite 1400
Seattle, WA 98101-1616
Tel: 206.438.2700
Fax: 206.438.2699
www.urscorp.com

Table 4
Construction Dewatering Water Influent Concentrations and Treatment Goals

Constituent	Expected Maximum Influent Concentration	Treatment Goal	Basis for Treatment Goal	Treatment Expected to be Necessary?
Arsenic	NA	0.5 mg/L	Everett POTW limit	No
Cadmium	NA	0.24 mg/L	Everett POTW limit	No
Chromium	<0.005 mg/L	5.0 mg/L	Everett POTW limit	No
Copper	0.006 mg/L	3.0 mg/L	Everett POTW limit	No
Lead	0.001 mg/L	1.89 mg/L	Everett POTW limit	No
Mercury	NA	0.1 mg/L	Everett POTW limit	No
Nickel	NA	2.83 mg/L	Everett POTW limit	No
Silver	NA	0.49 mg/L	Everett POTW limit	No
Zinc	0.082 mg/L	4.0 mg/L	Everett POTW limit	No
pH	6 to 8 SU	5.0 to 10.0 SU	Everett POTW limit	No
Closed Cup Flashpoint	Greater than 140 degrees F	Minimum 140 degrees F	Everett POTW limit	No
TCE	0.0058 mg/L	Non-interference	Everett POTW limit	No
PCBs	<0.000017 mg/L	0.003 mg/L	TSCA	No
PAHs	<0.000010 mg/L	Non-interference	Everett POTW limit	No

Although historic data are not available for some metals in water for which the Everett POTW has an established discharge limit, there is no known source for these metals at the Boeing Everett Facility. Metals for which data are available are found at concentrations several orders of magnitude below the discharge limits. Construction dewatering water will be filtered to reduce the total suspended solids and sampled for the complete list of metals (and other potential contaminants) in this table prior to discharge.

Notes:
F – Fahrenheit
PCBs – polychlorinated biphenyls
PAHs – polynuclear aromatic hydrocarbons
mg/L – micrograms per liter
NA – historic samples were not analyzed for this metal because there is no known source of this metal at the facility
POTW – publicly-owned treatment works
SU – standard units
TCE – trichloroethene
TSCA – toxic substances control act limit for sanitary sewer discharge
< - less than

APPENDIX B

Design Data and Calculations

Analytical Resources, Incorporated
Analytical Chemists and Consultants

Client: The Boeing Company	Project No.: IT96
Client Project: Boeing Everett Interim Action – Powder Mill Gulch	

Case Narrative

1. The samples were submitted for grain size analysis according to PSEP methodology.
2. The samples were run in a single batch, and one sample was chosen for triplicate analysis. The triplicate data is reported on the QA summary.
3. Samples SED-PMG3B-1.5-051117 and SED-PMG20-1 to 1.5-051117 were mostly sand. Sample SED-PMG20-1 to 1.5-051117 had less than the required 5 grams in the pipette portion. Our balance has a capacity of about 200 g (by 0.0001), and a sample size that would give 5 grams of fines could not be split and stay within the capacity of the balance.
4. The data is provided in summary tables and plots.
5. There were no other noted anomalies in the samples or methods on this project.

Approved by: Taylor McKenzie Date: 12/5/05
Title: Lead Technician

4611 South 134th Place, Suite 100 • Tukwila WA 98168 • **206-695-6200** • **206-695-6201** fax

ANALYTICAL RESOURCES INCORPORATED

The Boeing Company
Boeing Everett Interim Action-Powder Mill Gulch

Apparent Grain Size Distribution Summary
Percent Finer Than Indicated Size

Sample No.	Gravel			Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt				Clay	
Phi Size	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
Sieve Size (microns)	3/8"	#4	#10 (2000)	#18 (1000)	#35 (500)	#60 (250)	#120 (125)	#230 (62)	31.00	15.60	7.80	3.90	2.00	1.00
C-3	100.0	78.9	74.8	71.0	64.1	46.7	24.9	12.3	8.6	6.7	5.6	4.5	3.4	2.5
C-3	100.0	81.7	78.5	74.1	66.7	48.7	25.9	12.7	8.8	7.0	5.7	4.6	3.6	2.5
C-3	100.0	74.2	70.7	66.9	60.1	43.2	23.0	11.3	7.9	6.4	5.3	4.3	3.2	2.1
SED-PMG3B-1.5-051117	100.0	84.9	69.6	57.7	40.3	21.0	10.8	6.5	4.4	3.2	2.4	1.7	1.2	0.8
SED-PMG20-1 to 1.5-051117	100.0	95.2	88.1	78.2	51.5	14.1	3.8	2.5	2.3	1.8	1.4	0.9	0.6	0.4

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

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ANALYTICAL RESOURCES INCORPORATED

The Boeing Company
Boeing Everett Interim Action-Powder Mill Gulch

Apparent Grain Size Distribution Summary
Percent Retained in Each Size Fraction

Sample No.	Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Coarse Silt	Medium Silt	Fine Silt	Very Fine Silt	Clay		
Phi Size	> -1	-1 to 0	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5	5 to 6	6 to 7	7 to 8	8 to 9	9 to 10	< 10
Sieve Size (microns)	> #10 (2000)	10 to 18 (2000-1000)	18-35 (1000-500)	35-60 (500-250)	60-120 (250-125)	120-230 (125-62)	62.5-31.0	31.0-15.6	15.6-7.8	7.8-3.9	3.9-2.0	2.0-1.0	<1.0
C-3	25.2	3.8	6.9	17.4	21.8	12.5	3.7	1.9	1.1	1.1	1.1	0.9	2.5
C-3	21.5	4.4	7.4	18.0	22.8	13.3	3.9	1.8	1.2	1.1	1.0	1.1	2.5
C-3	29.3	3.8	6.7	17.0	20.1	11.8	3.4	1.5	1.1	1.0	1.1	1.1	2.1
SED-PMG3B-1.5-051117	30.4	12.0	17.3	19.4	10.2	4.2	2.2	1.1	0.8	0.7	0.5	0.4	0.8
SED-PMG20-1 to 1.5-051117	11.9	9.9	26.7	37.5	10.3	1.3	0.2	0.5	0.4	0.5	0.3	0.2	0.4

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

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ANALYTICAL RESOURCES INCORPORATED

The Boeing Company
Boeing Everett Interim Action-Powder Mill Gulch

PSEP Total Solids Analysis
Percent of Wet Weight

Sample No.	Total Solids (%)
C-3	69.5
C-3	69.0
C-3	70.9
SED-PMG3B-1.5-051117	94.0
SED-PMG20-1 to 1.5-051117	90.8

Triplicate Average	69.8
Standard Deviation	0.98
%RSD	1.40

(Total Solids at 90 C)

0

QA SUMMARY

ANALYTICAL RESOURCES INCORPORATED

PROJECT:	The Boeing Company	Project No.:	Boeing Everett Interim Action-Powder Mill Gulch
ARI Triplicate Sample ID:	IU01 C	Batch No.:	IT98
Client Triplicate Sample ID:	C-3	Page:	1 of 1

Relative Standard Deviation, By Phi Size

Sample ID	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10
C-3	100.0	78.9	74.8	71.0	64.1	46.7	24.9	12.3	8.6	6.7	5.6	4.5	3.4	2.5
C-3	100.0	81.7	78.5	74.1	66.7	48.7	25.9	12.7	8.8	7.0	5.7	4.6	3.6	2.5
C-3	100.0	74.2	70.7	66.9	60.1	43.2	23.0	11.3	7.9	6.4	5.3	4.3	3.2	2.1
AVE	NA	78.25	74.68	70.66	63.65	46.19	24.61	12.09	8.44	6.69	5.54	4.45	3.39	2.38
STDEV	NA	3.79	3.91	3.63	3.31	2.80	1.47	0.74	0.50	0.30	0.22	0.15	0.19	0.21
%RSD	NA	4.84	5.23	5.13	5.20	6.07	5.99	6.10	5.98	4.45	4.03	3.34	5.47	9.00

The Triplicate Applies To The Following Samples

Client ID	Date Sampled	Date Extracted	Date Complete	QA Ratio (95-105)	Data Qualifiers	Pipette Portion (5.0-25.0g)
C-3	11/21/05	11/23/05	12/1/05	100.5		6.9
C-3	11/21/05	11/23/05	12/1/05	100.1		6.9
C-3	11/21/05	11/23/05	12/1/05	99.9		5.9
SED-PMG3B-1.5-051117	11/17/05	11/28/05	12/2/05	100.3		9.6
SED-PMG20-1 to 1.5-051117	11/17/05	11/28/05	12/2/05	99.6	SS	3.3

* ARI Internal QA limits = 95-105%

Notes to the Testing:

1. Organic matter was not removed prior to testing, thus the reported values are the "apparent" grain size distribution. See narrative for discussion of the testing.

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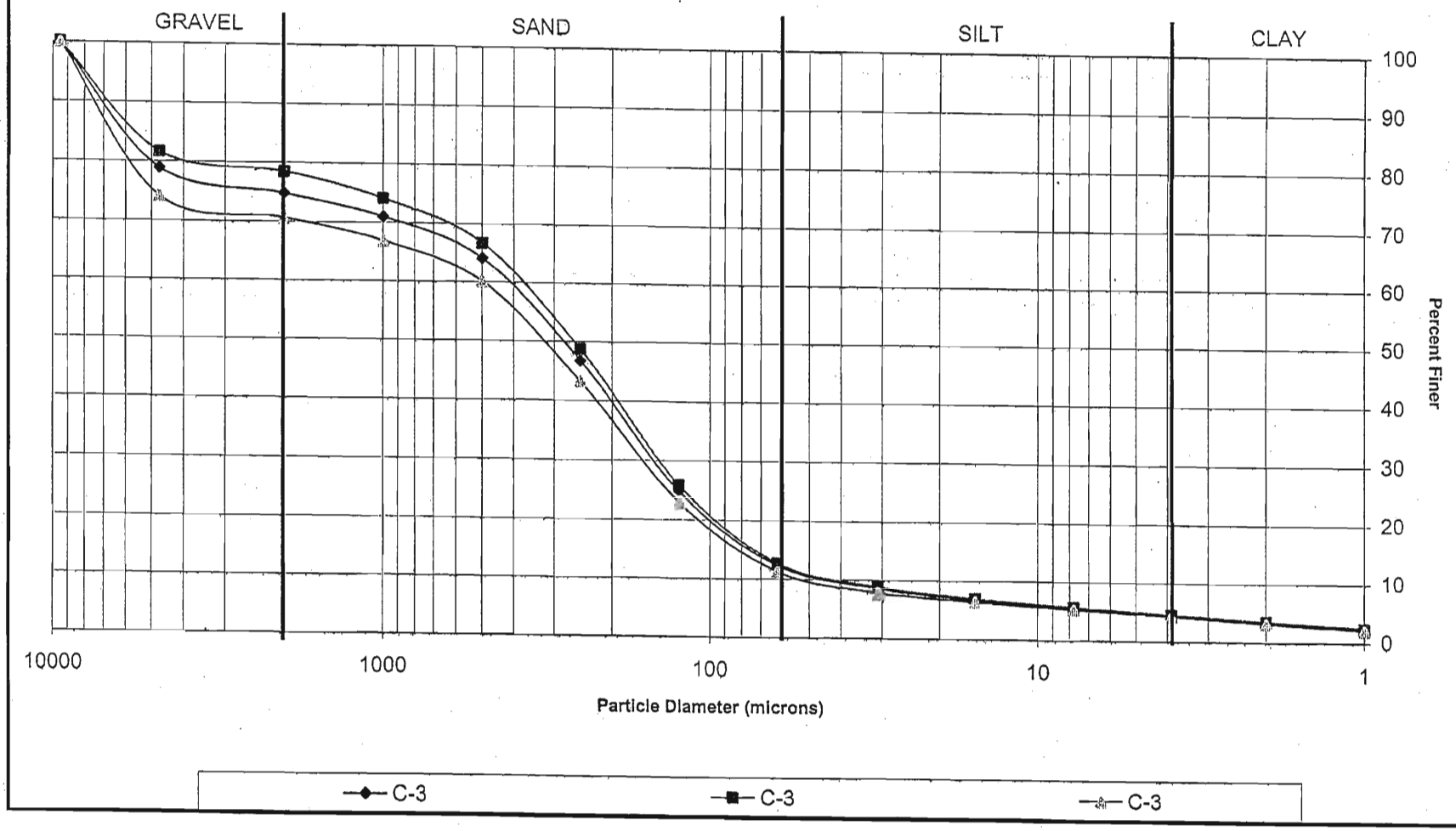
ANALYTICAL RESOURCES INCORPORATED

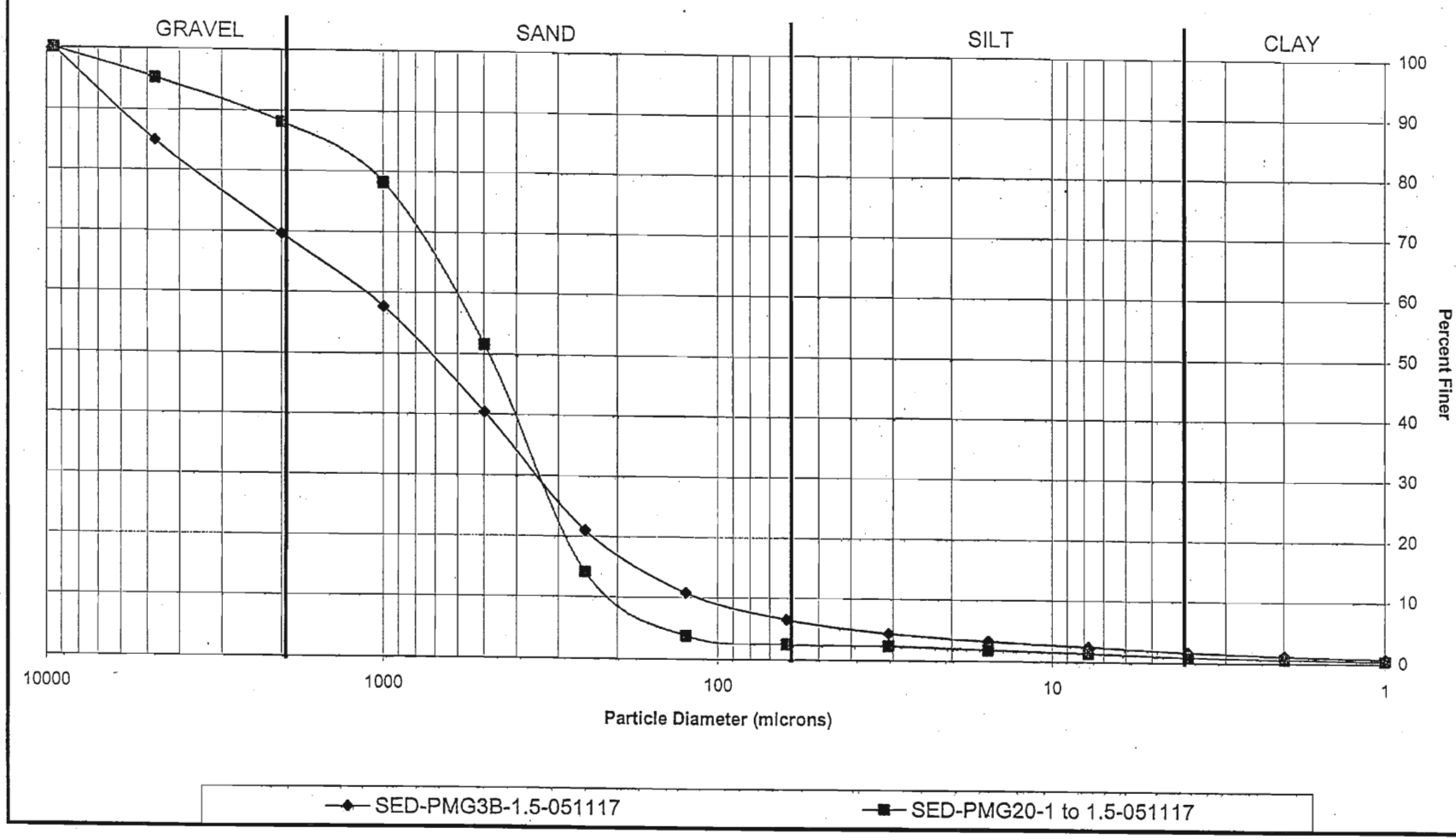
PSEP Grain Size Distribution

Triplicate Sample Plot



ANALYTICAL RESOURCES INCORPORATED

PSEP Grain Size Distribution



ANALYTICAL RESOURCES INCORPORATED

DATA QUALIFIERS FOR PHYSICAL ANALYSES

SM Indicates that the sample matrix was not appropriate for the requested analysis. This normally refers to samples contaminated with an organic product that interferes with moisture content, porosity, and saturation calculations that assume only water is present. It can also cause particles to adhere to one another, causing errors in grain size distribution analyses.

SS Indicates that the sample was not appropriate for the method requested because it did not contain the proportion of "fines" required to perform the pipette portion of the analysis.

W Indicates that the amount of sample in some pipette readings was below the level required for accurate weighing, resulting in negative weights, which were adjusted to eliminate the negative value.

F Indicates that the samples were frozen prior to particle size determination.

URS

Job BOEING POWDER MILL GULCH Project No. _____ Page 1 of 24

Description HYDRAULICS & SCOUR Computed by SMF Date 31 MAR 06

Checked by Cgf Date 4-6-06

Reference

CONTENTS

URS

Page 1 of 2

Job BOEING POWDERMILL GULCH Project No. _____ Sheet ____ of ____

Description CHANNEL SHAPE Computed by SMF Date _____

Checked by _____ Date _____

Reference

BY ITERATION IN CHANNEL_DESIGN XLS (SEE ATTACHED)

TARGETS:

$Q = 50$ CFS	DISCHARGE FROM POND
$D < 2$ FT	FLOW DEPTH
$FF < 0.75$	FROUDE NO. FOR STABLE CHANNEL
$S = 0.03$	CHANNEL SLOPE, BY GEOMETRY
$W_T < 15'$	CH. TOP WIDTH, BY GEOMETRY

NOTE: CHANNEL SLOPE SET BY LAYOUT OF LENGTH, WITH A DROP STRUCTURE/BOULDER CASCADE
MAX TOP WIDTH IS APPROX MIN EXISTING DISTANCE BANK TO BANK

USING MANNING EQN & FROUDE NO. EQN

RESULTING GEOMETRY - 2 STAGE CHANNEL

$W_B = 2'$	BOTTOM WIDTH
$SS_L = 2:1$	SIDE SLOPE LOWFLOW (H:V)
$d_L = 1$	DEPTH LOW FLOW CHANNEL
$d_F = 1$	DEPTH OF FULL FLOW ADDITION
$SS_F = 3:1$	SIDESLOPE
$W_T = 12'$	TOP WIDTH

FUNCTION OF ROUGHNESS

n	D	FF	V (FPS) VELOCITY
0.05	1.76	0.87	4.85
0.055	1.83	0.79	4.50
0.06	1.90	0.73	4.21

AIM FOR $n = 0.055$

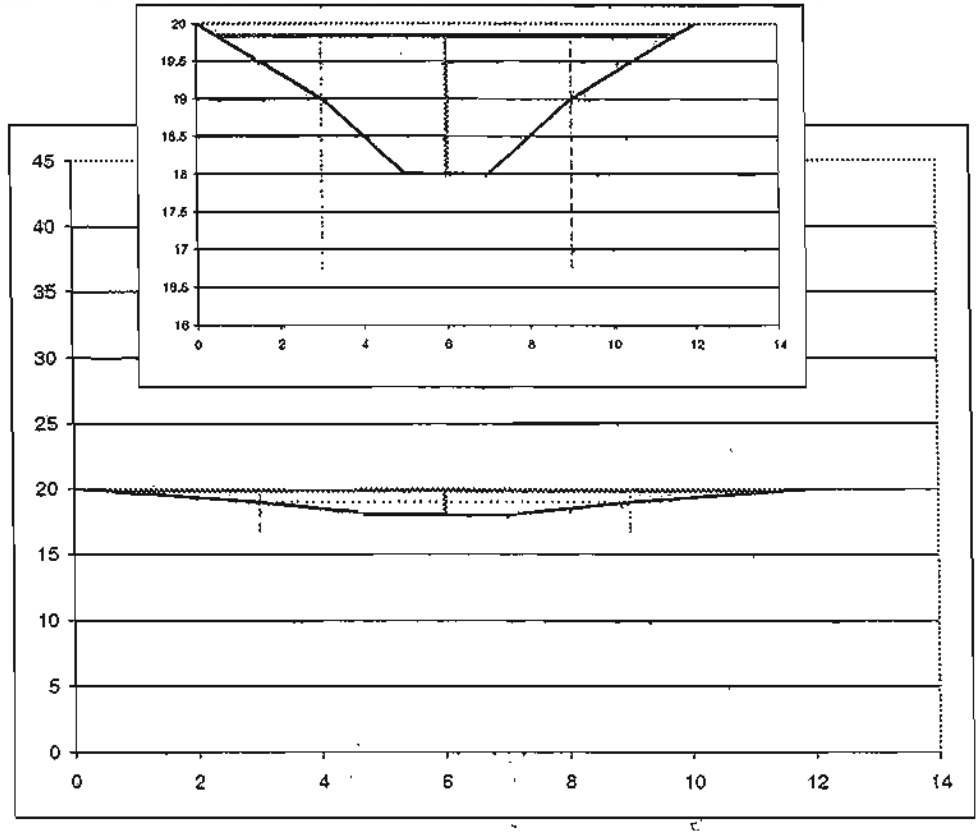
$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

R = A/P
A = cross sectional area
P= wetted perimeter
S = slope of channel
n = Manning's roughness coefficient

bottom width	2
Slope 1	2
depth 1	1
max top width	6
Slope 2	3
depth 2	1
max top width	12
Manning n	0.055
Channel Slope	0.03
Flow Depth	1.83
Area 1	4.00
Area 2	7.10
Area Total	11.10
WetPerim 1	6.47
WetPerim 2	5.28
WetPerim Total	11.75
TopWidth 1	6.00
TopWidth 2	11.01
TopWidth total	11.01
HydRadius	0.94
HydDepth	1.01 H
velocity	4.50 V
Q - calculated	50.00
Froude	0.79
StreamPower	7.96

station	elevation
0	20
3	19
5	18
7	18
9	19
12	20
2.5	19
9.5	19
3	16.75
3	19.75
9	16.75
9	19.75
6	18
6	19.8348
0.495667	19.8348
11.50	19.8348

elev chng	length	slope
10	250	0.04
10	500	0.02
10	300	0.03
		13.33333



$F = V/(gH)^{1/2} = (Q/A)/(gA/T)^{1/2}$

F = Froude Number
V = Velocity
H = Hydraulic Depth (A/T)
T = Top Width (width of channel at the water surface)
g = Acceleration due to gravity (32.2 ft/s2)
A = Flow area

$SP = VS_wRS_o = (Q/A)Sw(A/P)S_o$

V = Velocity, fx(Q,n,R,Sf), use Manning's Eqn
S_w = Specific Weight (62.40 lb/ft3 @50 F)
R = Hydraulic Radius (A/P)
S_o = Slope of Channel
A = Flow Area
P = Wetted Perimeter

	50	0.055	0.03	1.83	0.79	2	1	3	11.01	4.50	7.96
RESULTS											
	Q	n	slope	depth	Fr	lowWidth	lowDepth	hiSlope	topWidth	velocity	streamPower
	50	0.07	0.04	1.78	0.73	1	2	5	12.17	4.11	9.79
	50	0.06	0.04	1.67	0.84	1	2	5	11.50	4.62	10.37
	50	0.06	0.04	1.67	0.83	1	1	5	14.15	4.27	8.54
	50	0.06	0.04	1.66	0.82	1	1	7	16.72	4.01	7.26
	5	0.06	0.04	0.59	0.73	1	1	5	5.07	2.56	2.37
	10	0.06	0.04	0.82	0.76	1	1	5	6.43	3.07	3.72
						1					
	50	0.06	0.02	1.90	0.60	1	1	5	18.51	3.27	3.67
	5	0.06	0.02	0.70	0.53	1	1	5	5.70	1.98	1.05
	10	0.06	0.02	0.96	0.55	1	1	5	7.27	2.37	1.65
	50	0.06	0.02	1.87	0.59	1	1	7	19.73	3.05	3.09
	50	0.06	0.02	1.91	0.60	1	1	4	14.81	3.40	4.06
	50	0.06	0.04	1.67	0.83	1	1	4	12.83	4.43	9.37
	50	0.06	0.03	2.08	0.73	1	1	3	11.49	4.20	7.60
	50	0.055	0.03	1.83	0.79	2	1	3	11.01	4.50	7.96
	10	0.055	0.03	0.86	0.72	2	1	3	5.44	3.13	3.20
	50	0.06	0.03	1.99	0.73	2	1	3	11.42	4.21	7.68

Reference

FROM HEC-20

RESISTANCE TO FLOW IN CHANNELS (SECTION 5.3.4)

GRAVEL, COBBLE, BOULDER BEDS (EQN 5.10)

$n = K_u D_{50}^{1/6}$ D_{50} INCHES

$K_u = 0.04$ ENGLISH UNITS

LIMERINOS EQN FOR SMALL GRAVEL TO MED BOULDERS (5.11)

$n = K_u R^{1/6} / (1.16 + 2.08 \log(\frac{R}{D_{84}}))$

D_{84} FEET

R = HYDRAULIC RADIUS IN FEET

$K_u = 0.09226$

SOLVING FOR DIAMETERS IN INCHES (FROM SPREADSHEET)

n	D_{50}	D_{84}
.04	1.0	3.3
.05	3.8	5.6
.055	6.8	6.7
.06	11.4	7.9

NOTE EFFECT ON n DUE TO OBSTRUCTIONS, ETC (SECTION 5.3.4 - CALCS IN CHANNEL-ROUGHNESS.XLS) CAN BE .02 - .03, SO AIM FOR SMALLER ROCK (LOWER n) SO OVERALL ROUGHNESS ACHIEVED.

FROM HEC-20
Resistance to Flow in Channels (section 5.3.4)

$n = (nb + n1 + n2 + n3 + n4)\ m$

- nb = base value for straight uniform channel
- n1 = surface irregularities
- n2 = variations in shape and size of channel
- n3 = obstructions
- n4 = vegetation and flow conditions
- m = correction for channel sinuosity

n	rating	range	selection
n	mixed cobble/boulder	.04 - .065	0.05
n1	moderately rough bed & banks	.006 - .010	0.008
n2	few changes in channel shape	0	
n3	obstruction 15-50% of xsec	.02 - .03	0.02
n4	negligible vegetation	0	
m	minor sinuousity		1
		total n	0.078

Resistance to Flow in Coarse Material Channels

for gravel and small cobble and boulder bed channels (eqn 5.10)

$n = K_u D_{50}^{1/6}$

D_{50} in **inches**

$K_u = 0.04$

Limerinos (Eqn 5.11) small gravel to medium size boulders

$n = K_u R^{1/6} / (1.16 + 2.08 \log (R/D_{84}))$

$D_{84} = R / \text{power}(10, (K_u R^{1/6} / n - 1.16) / 2.08)$

R = hydraulic radius

D_{84} in **feet**

$K_u = 0.0926$

For particular "n", that results in Ds of:

From channel design calcs R is very close to 1 ft

n	D50 (in)	D84 (ft)	D84 (in)
0.03	0.18	0.12	1.42
0.035	0.45	0.19	2.32
0.04	1.00	0.28	3.34
0.045	2.03	0.37	4.44
0.05	3.81	0.46	5.58
0.055	6.76	0.56	6.72
0.06	11.39	0.65	7.85

Reference for comparison

material	size	base Manning's n
gravel	.1 - 2 "	.028 - .035
cobble	2.5 - 10"	.03 - .05
boulder	> 10"	.04 - .07

Reference

ROCK SIZING PER NRCS 210-VI-EFH STREAMBANK STABILIZATION

ISBASH CURVE

5 FPS → ϕ = 13.5" WT = 20 #

15 FPS → ϕ = 34" WT = 2400 #

FAR WEST STATES

R_C = CURVE RADIUS = 25-30

W_S = WATER SURFACE WIDTH = 11'-12

S = SLOPE = 0.03

$\frac{R_C}{W} = \frac{25-30}{11-12} = 2-2.7 \Rightarrow C_{MIN} = 0.6$

SIDE SLOPE 2:1 - 3:1 $\Rightarrow$ K = .72 TO .87

DEPTH OF FLOW = 2' S = .03 $\Rightarrow$ D_S = 34"

$D_{50} = \frac{3.5 \, W \, D \, S}{C \, K} = \frac{3.5}{(0.6)(.72 \text{ TO } .87)} \frac{(62.4)(2)(0.03)}{}$

= 25 TO 30" 36" IF C = 0.5

FROM 16A-3

@ D_{75}, K_D = 1.18 $\phi = \frac{D_{75} K}{1.18}$

	K_{LOW}	K_{HIGH}	ϕ_{LOW}	ϕ_{HIGH}	$D_{50=12}$ LOW	$D_{50=18}$
D100	1.28	2	39	61	15.5	
D85	1.24	1.83	38	56	15	22
D80	1.21	1.76	37	54	14.5	
D75	1.18	1.73	36	53	14	
D50	1.0	1.44	30.5	44	12	18
D20	.7	1.05	21.	32		
D15	.59	0.96	18	29	7	10
D10	.50	0.90	18	27		

FROM HEC-18

$V_c = k_u\, y^{1/6} D^{1/3}$ EQN 5.1

V_c = critical velocity when material starts to move (fps)

k_u = 11.17 (english units)

y = depth in channel (ft)

D = diameter of interest, usually D_{50} (ft)

y (ft)	D (ft)	V_c (fps)		
2	0.5	9.95		
2	1	12.54		
2	0.0634	5.00	D =	0.76 inches

from FHWA RD-02-078

$V_c = k_u\, y^{1/6} D_{50}^{1/3}$ Niell's concept (EQN 11)

k_u = 11.5 (english units)

y (ft)	D (ft)	V_c (fps)		
2	0.5	10.25		
2	1	12.91		
2	0.0581	5.00	D =	0.70 inches

URS

Job BOEING POWDER MILL GULCH | Project No. | Page 1 of 6
Description SCOUR CALCS | Computed by SMF | Sheet ___ of ___
Checked by | Date

Reference

CLEAR WATER SCOUR (HEC-18 EQN 5.4)

WHEN VELOCITY LESS THAN CRITICAL VELOCITY, SCOUR CAN POTENTIALLY BE CLEAR WATER

$$\frac{y_s}{y_1} = \left[\frac{0.0077\,Q^2}{D_m^{1.67}\,W^2}\right]^{0.43}$$

← THIS IS CONTRACTION SCOUR EQN

y_s = SCOURED DEPTH (REGULAR + SCOUR)
Q = DISCHARGE
$D_m = 1.25 D_{50}$
W = CHANNEL BOTTOM WIDTH

FROM SPREADSHEET
IF $D_{50} = 0.5$ FT
$W = 2$ FT
SCOUR COULD BE 0.45'

BEND SCOUR (ISPG) EQN 8

$$d = y_1\left(1.07 - \log\left(\frac{R_c}{W} - 2\right)\right) \quad \text{FOR } 2 < \frac{R_c}{W} < 22$$

d = MAX DEPTH OF SCOUR (FT)
y_1 = AVG FLOW DEPTH (FT)
W = FLOW WIDTH (FT) BANK FULL TOP WIDTH
R_c = RADIUS OF CURVATURE (FT)

R_c = 25-30 AS MEASURED IN CAD $\frac{30}{11} = 2.73$ $\frac{25}{11} = 2.27$
y_1 = 1 FT
W = 11 FT

$$d = (1)\left(1.07 - \log\left(\frac{25}{11} - 2\right)\right) = 1.63'$$

Job ______ Project No. ______ Sheet ___ of ___

Description SCOUR CALCS Computed by ______ Date ______

Checked by ______ Date ______

Reference

BEND SCOUR CONTINUED

$$\frac{D_{mb}}{D_u} = 1.8 - 0.051\left(\frac{R_c}{W}\right) + .0084\left(\frac{W}{D_u}\right) \qquad \text{EQN 9}$$

D_{mb} = MAX WATER DEPTH (SCOURED DEPTH)
D_u = MEAN CHANNEL DEPTH

$$D_{mb} = (1)\left(1.8 - .051\left(\frac{25}{11}\right) + .0084\left(\frac{11}{1}\right)\right)$$

$= 1.78$ FT CONSIDERED CONSERVATIVE FOR LARGER THAN SAND BED

DROP WEIR SCOUR

VERTICAL (EQN 13)

$$d_s = K H_t^{0.225} q^{0.54} - d_m \qquad q = \frac{50}{\text{AVG}(11, 6.2) \approx 6.33} = \frac{1.42 \text{ CMS}}{1.93} = 0.74$$

d_s = SCOUR DEPTH BEYOND NORMAL DEPTH (m)
$K = 1.9$
H_t = HEAD DIFFERENCE U/S TO D/S (m)
d_m = TAILWATER DEPTH (m)

SAY 4 FT BOULDER IS A BROADCRESTED WEIR

$Q = C L H^{3/2}$

$C = 2.6$ $L = 2.5$ $Q = 50$ SPLIT ACROSS 2 BOULDERS

$\Rightarrow H = (Q/CL)^{2/3} = (25/(2.6)(2.5))^{2/3} = 2.45$ FT

$A = (2.5+2.5)(2.45) = 12.25$ ASSUME RECTANGULAR AREA

$V = Q/A = 50/12.25 = 4.1$ FPS

$EGL_{u/s}$ = BOULDER HEIGHT + H + $\frac{V^2}{2g}$ ACTIVE BOULDER HEIGHT ≈ 3'

$= 3 + 2.45 + (4.1)^2/64.34 = 5.71$ FT

$EGL_{D/S} = d_m + V^2/2g$ d_m FROM HYDRAULICS

$= 1.8 + 4.5^2/64.34 = 2.11$ FT $= 0.64$ m

$H_t = 5.71 - 2.11 = 3.60$ FT $= 1.10$ m

$d_s = 1.9(1.10)^{.225}(0.74)^{.54} - 0.64 = 1.0$ m $= 3.28$ ft

"MAX TAKE ... [illegible]"

Job _____ Project No. _____ Sheet ____ of ____

Description SCOUR CALCS Computed by _____ Date _____

Checked by _____ Date _____

Reference

DROP WEIR - CONTINUED

SLOPING SILL (EQN 14)

$$d_s = \left(\left[4 (Y_c/D_{50})^{0.2} - 3(R_{50}/Y_c)^{0.1} \right] Y_c \right) - d_m$$

d_s = DEPTH OF SCOUR (ft)
Y_c = CRITICAL DEPTH (ft)
D_{50} = SIZE OF MATERIAL BEING SCOURED (FT)
R_{50} = SIZE OF STONE THAT MAKES UP WEIR (FT)
d_m = TAILWATER DOWNSTREAM (ft)

$Y_c = 1.65$ FROM HYDRAULICS SHEET "CRITICAL DEPTH"
$D_{50} = 1.0''$ FROM CRITICAL VELOCITY CALC
$= 0.08'$
$R_{50} = 1'$
$d_m = 2'$

$$d_s = \left(\left[4 (1.65/.08)^{.2} - 3(1/1.65)^{0.1} \right] (1.65) \right) - 2$$

$= 5.4'$! THIS SEEMS TOO HIGH

WE DO NOT HAVE A "SLOPING SILL" BECAUSE OF THE 4-FT BOULDERS DOWNSTREAM. MORE OF A VERTICAL DROP

Reference

BUREAU OF REC METHOD OF SCOUR (ISPG)

NEILL EQN $Y_N = Y_{BF}\left(\frac{q_d}{q_{BF}}\right)^M$

$= 2\left(\frac{q_d = q_{BF}}{}\right)^{1.0\ .85} = 2$

Y_{BF} = BF DEPTH

q_d = DESIGN DISCHARGE PER UNIT W

q_{BF} = BF Q PER UNIT W

$m = .85$ FOR COARSE GRAVEL

LACEY EQN $Y_L = 0.47\left(\frac{Q}{f}\right)^{.33}$

$f = 1.76\left(\frac{0.5\ FT}{3.28084\ FT/M} * \frac{1000\ MM}{M}\right)^{1/2}$

$= 21.73$

$Y_L = 0.47\left(\frac{50}{21.73}\right)^{.33}$

$= 0.62$ FT

Q = DISCHARGE

f = SILT FACTOR $= 1.76 D_{50}^{1/2}$

D_{50} = BED MAT'L IN MM

BLENCH EQN $Y_B = q_d^{.67} / F_{BO}^{.33}$

$F_{BO} = 15$

$Y_B = \left(\frac{50}{6.33}\right)^{.67} / 15^{.33}$

$= 1.63$ FT

q_d = DESIGN FLOW PER WIDTH

F_{BO} = BED FACTOR FROM E-6

AVG WIDTH = 6.33 ← FROM SHT 2

ADJUSTMENTS

$d_N = K_N Y_N$ K_N WORST CASE = 1.0

$d_L = K_L Y_L$ K_L " " = 1.50

$d_B = K_B Y_B$ K_B " " = 1.25

$d_N = Y_N = 2'$

$d_L = (1.5)(0.62) = 0.93'$

$d_B = (1.25)(1.63) = 2.0'$

LESS CONSERVATIVE ESTIMATE OF SCOUR DUE TO GRADE CONTROL STRUCTURES. ALL LESS THAN VERTICAL.

FROM HEC-18

$y_s = [\ 0.0077\ Q^2 / D_m^{0.67}\ W^2\ ]^{0.43}$

y_s = channel depth after scour (ft)

Q = discharge (cfs)

D_m = diam of non-transportable = 1.25 * D_{50}

W = channel bottom width (ft)

y = channel depth before scour

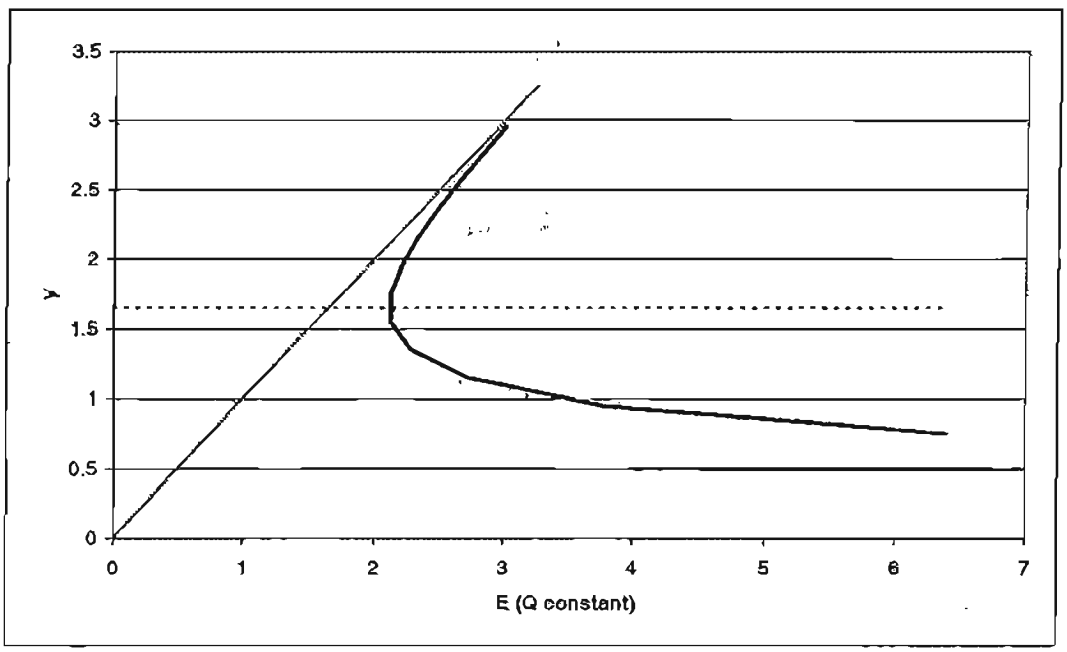
d = depth of scour

Q	W	D50	Dm	ys	y	d
cfs	ft	ft	ft	ft	ft	ft
50	2	0.25	0.3125	2.75	1.8	0.95
50	2	0.5	0.625	2.25	1.8	0.45
50	2	1	1.25	1.84	1.8	0.04
50	1	0.25	0.3125	4.99	2	2.99
50	1	0.5	0.625	4.08	2	2.08
50	1	1	1.25	3.34	2	1.34

$Q = (1.486/n)AR_h^{2/3}S^{1/2}$

R = A/P
A = cross sectional area
P= wetted perimeter
S = slope of channel
n = Manning's roughness coefficient

		0.2	area	top width	wetted perim	hyd radius	discharge	hyd depth	velocity	Froude	Energy
bottom width	2	y	A	TW	P	HR	Q	HD	V	F	E
Slope 1	2	0.75	2.625	5	5.35	0.49	50.00	0.53	19.05	4.63	6.39
depth 1	1	0.95	3.705	5.8	6.25	0.59	50.00	0.64	13.50	2.98	3.78
max top width	6	1.15	4.9675	6.9	7.42	0.67	50.00	0.72	10.07	2.09	2.72
		1.35	6.4675	8.1	8.69	0.74	50.00	0.80	7.73	1.53	2.28
Slope 2	3	1.55	8.2075	9.3	9.95	0.82	50.00	0.88	6.09	1.14	2.13
depth 2	1	1.75	10.1875	10.5	11.22	0.91	50.00	0.97	4.91	0.88	2.12
max top width	12	1.95	12.4075	11.7	12.48	0.99	50.00	1.06	4.03	0.69	2.20
		2.15	14.8675	12.9	13.75	1.08	50.00	1.15	3.36	0.55	2.33
Manning n	0.055	2.35	17.5675	14.1	15.01	1.17	50.00	1.25	2.85	0.45	2.48
Channel Slope	0.03	2.55	20.5075	15.3	16.28	1.26	50.00	1.34	2.44	0.37	2.64
		2.75	23.6875	16.5	17.54	1.35	50.00	1.44	2.11	0.31	2.82
		2.95	27.1075	17.7	18.81	1.44	50.00	1.53	1.84	0.26	3.00
	CRITICAL DEPTH	1.65	9.162062	9.896704	10.58	0.87	50.00	0.93	5.46	1.00	2.11



Job _____ Project No. _____ Sheet ____ of ____

Description ROCK LINING THICKNESS AND GRADATION Computed by SMF Date _____

Checked by _____ Date _____

Reference

FROM HEC-15 (PG 19)

THICKNESS OF RIPRAP LINING SHOULD EQUAL THE DIAMETER OF THE LARGEST ROCK SIZE IN GRADATION

↘ THIS MEANS, THICKNESS WILL BE 1.5 TO 3 TIMES THE D50.

SAME FOR THICKNESS OF FILTER

↳ THICKNESS SHOULD BE MAX SIZE IN FILTER GRAD

FILTER DESIGN (HEC-15)

$$\frac{D_{15\text{-UNDER}}}{D_{85\text{-OVER}}} < 5 < \frac{D_{15\text{-UNDER}}}{D_{15\text{-OVER}}} < 40 \qquad \text{(EQN 11)}$$

$$\frac{D_{50\text{-UNDER}}}{D_{50\text{-OVER}}} < 40 \qquad \text{(EQN 12)}$$

THESE RELATIONSHIPS MUST HOLD BETWEEN EXCAVATED SUBGRADE (STREAMBED = UNDER) AND FILTER MATERIAL, AND BETWEEN FILTER MATERIAL AND CHANNEL MATERIAL (RIVER ROCK).

FROM SOILS BOOK

FOR MATERIAL TO BE "WELL GRADED" SO IT WILL TAMP IN PLACE FIRMLY

$C_u = \frac{D_{60}}{D_{10}}$ C_u = COEF OF UNIFORMITY WANT $C_u > 15$

$C_c = \frac{D_{30}^2}{D_{10}D_{60}}$ C_c = COEF OF CURVATURE IF $C_u > 4$ AND C_c BETWEEN 1 AND 3 THEN WELL GRADED

Table 02940-2
RIVER ROCK GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
15-inch	100
12-inch	50-60
9-inch	30
3-inch	10-15
1/4-inch	0

Table 02940-3
9-INCH ROCK GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
12-inch	100
9-inch	75
7-inch	50
1/4-inch	0

Table 02940-4
FILTER GRAVEL GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
2 to 6-inch	100
1-inch	60
3/4-inch	50
1/2-inch	30
1/4-inch	10-15
No. 4 sieve	0-5

ORIGINAL GRADATIONS BASED ON MY ANALYSIS IN "GRADING.XLS"

Table 02940-4
RIVER ROCK GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
15-inch	100
12-inch	60 - 100
6-inch	35 - 80
3-inch	10 - 45
1/4-inch	0 - 3

Table 02940-5
9-INCH ROCK GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
12-inch	100
9-inch	50 - 80
6-inch	30 - 50
1/4-inch	0

Table 02940-6
FILTER GRAVEL GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
3-inch	100
1-inch	40 - 80
1/2-inch	20 - 50
1/4-inch	5 - 25
No. 10 sieve	3 - 15

RANGES AND SIZES
ADJUSTED FOR CONSTRUCTIBILITY
BY DAN HAWK

percent passing		Streambed (subgrade) Material Distribution (from ARI report) #3B micron	inches	#20 micron	inches	D50	Channel Material (per Far West c 1 (ft)	(in)	Proposed Channel Grade (in)			Proposed Filter (in)	
100	D100		0.375		0.375		1.28	15.36	15	15.36	18	6	6
85	D85	4900	0.193	1500	0.059		1.24	14.88			18		
~~80~~	~~D80~~	~~3800~~	~~0.150~~	~~1100~~	~~0.043~~		~~1.21~~	~~14.52~~					
60	D60	1100	0.043	600	0.024		1.09	13.08	13	13.2	16	1	2
50	D50	720	0.028	495	0.019		1	12	12		16	0.8	0.8
30	D30	350	0.014	350	0.014		0.8	9.6	9	9.6	12	0.5	0.5
~~20~~	~~D20~~	~~250~~	~~0.010~~	~~295~~	~~0.012~~		~~0.7~~	~~8.4~~	9		~~9~~		
15	D15	190	0.007	260	0.010		0.59	7.08	6		6	0.28	0.28
10	D10	130	0.005	220	0.009		0.58	6.96	3		3	0.25	0.10

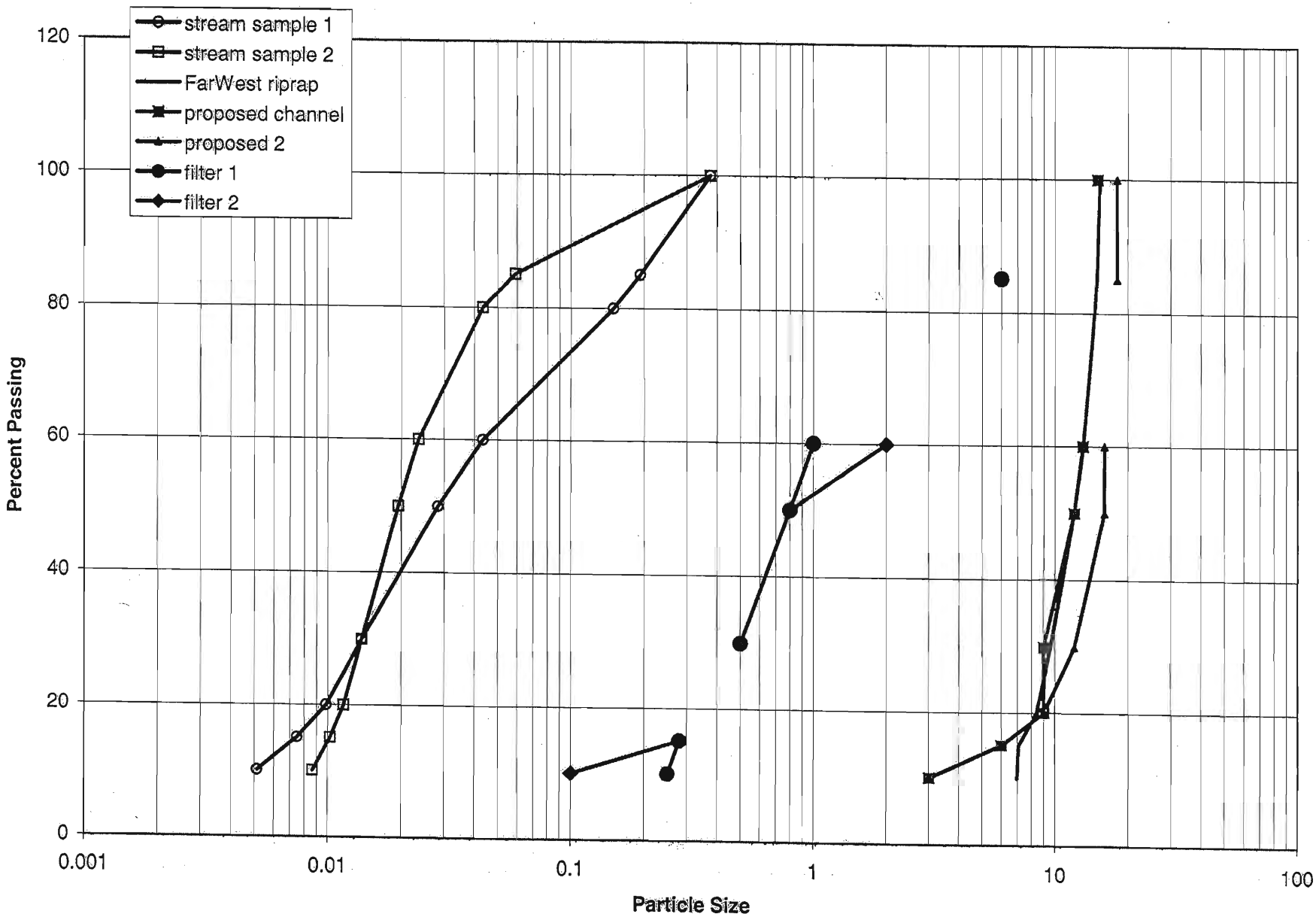
$C_u = D_{60}/D_{10}$ *If Cu low then poorly graded, If Cu > 15 then well graded*

	moderate		poorly		poorly		moderate		moderate		moderate		well	
C_u	8.46	grade	2.73	graded	1.88	graded	4.33	grade	5.33	grade	4.00	grade	20.00	graded

$C_c = D_{30}^2 / (D_{10} * D_{60})$ *Cc between 1 & 3 is well graded IF Cu > 4, else poorly graded*

	poorly		poorly		poorly		well		well		well		well	
C_c	0.86	graded	0.93	graded	1.01	graded	2.08	graded	3.00	graded	1.00	graded	1.25	graded

WITHOUT EFFECT
D85 of filter can be 2-6 inches
D15 of channel can be 3-6 inches
D85 of channel can be anything


stream sample 1
stream sample 2
FarWest riprap
proposed channel
proposed 2
filter 1
filter 2
120
100
80
60
40
20
0
Percent Passing
0.001
0.01
0.1
1
10
100
Particle Size

ALL DIMENSIONS IN INCHES

	Streambed Gradation		Channel Gradation			Filter Material
	#3B	#20	FW	Mine 1	Mine 2	
D85	0.19	0.06	15	18	15	
D50	0.03	0.02	12	16	12	
D15	0.007	0.01	7	6	6	

	Underlying Material	Overlying Material
D85	0.06	<-this value not required for one way test
D50	0.02	0.8
D15	0.01	0.3

		Update Overlying Material To		Update Underlying Material To	
D_{15}-over / D_{85}-under < 5	5.00	D15 >	0.05 > 5 D_{15}-under	D85 >	0.06 > D_{15}-over / 5
		D15 <	0.4 < 40 D_{15}-under	D15 >	0.0075 < D_{15}-over / 40
5 < D_{15}-over / D_{15}-under < 40	30.00	D15 <	0.3 < 5 D_{85}-under	D15 <	0.06 < D_{15}-over / 5
		D50 <	0.8 < 40 D_{50}-under	D50 >	0.02 < D_{50}-over / 40
D_{50}-over / D_{50}-under < 40	40.00				

	Streambed1	Filter	Channel
D85	0.06	2	15
D50	0.02	0.8	12
D15	0.01	0.28	6

	stream to filter	filter to channel
D_{15}-over / D_{85}-under < 5	4.67	3.00
5 < D_{15}-over / D_{15}-under < 40	28.00	21.43
D_{50}-over / D_{50}-under < 40	40.00	15.00

	Streambed2	Filter	Channel
D85	0.19	2	15
D50	0.03	0.8	12
D15	0.007	0.28	6

	stream to filter	filter to channel
D_{15}-over / D_{85}-under < 5	1.47	3.00
5 < D_{15}-over / D_{15}-under < 40	40.00	21.43
D_{50}-over / D_{50}-under < 40	26.67	15.00

	Streambed1	Filter	Channel
D85	0.06	6	15
D50	0.02	0.8	12
D15	0.01	0.28	3

	stream to filter	filter to channel
D_{15}-over / D_{85}-under < 5	4.67	0.50
5 < D_{15}-over / D_{15}-under < 40	28.00	10.71
D_{50}-over / D_{50}-under < 40	40.00	15.00

	Streambed2	Filter	Channel
D85	0.19	6	15
D50	0.03	0.8	12
D15	0.007	0.28	3

	stream to filter	filter to channel
D_{15}-over / D_{85}-under < 5	1.47	0.50
5 < D_{15}-over / D_{15}-under < 40	40.00	10.71
D_{50}-over / D_{50}-under < 40	26.67	15.00

	Streambed1	Filter	Channel
D85	0.06	6	15
D50	0.02	0.8	12
D15	0.01	0.25	3

	stream to filter	filter to channel
D_{15}-over / D_{85}-under < 5	4.17	0.50
5 < D_{15}-over / D_{15}-under < 40	25.00	12.00
D_{50}-over / D_{50}-under < 40	40.00	15.00

	Streambed2	Filter	Channel
D85	0.19	6	15
D50	0.03	0.8	12
D15	0.007	0.25	3

	stream to filter	filter to channel
D_{15}-over / D_{85}-under < 5	1.32	0.50
5 < D_{15}-over / D_{15}-under < 40	35.71	12.00
D_{50}-over / D_{50}-under < 40	26.67	15.00

WITHOUT EFFECT
D85 of filter can be 2-6 inches
D15 of channel can be 3-6 inches
D85 of channel can be anything

URS

Page 1 of 3

Job _____ Project No. _____ Sheet ____ of ____

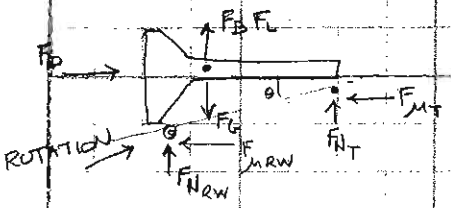
Description LOG ANCHORING Computed by SMF Date _____

_____ Checked by _____ Date _____

FROM NRCS TECH NOTE 15 Reference

LOG 2-3' DIAM, 6-8' LONG TOTAL PLUG LOG 14-16' 1.5' ϕ

ROOTWAD 2-4 × DIAM



F = FORCE B = BUOYANCY μ = FRICTION
G = GRAVITY L = LIFT
D = DRAG N = NORMAL

SAY RW DIAM = 6' , TREE 3' DIAM, 6' LONG

$\theta = \tan^{-1} \frac{\frac{1}{2} RW_{DIAM}}{LENGTH} = \tan^{-1}\left(\frac{3}{6}\right) = 26.5$
$= \tan^{-1}\left(\frac{3}{8}\right) = 20.5$ } USE 23.5°

DIST TO CENTER OF GRAVITY •

$X_1 = \left(\frac{1}{2} RW_{DIAM}\right) \sin\theta = 3 \sin 27 = 1.4'$
$= 3 \sin 21 = 1.1'$ } USE ANG = 1.25

VOL ROOTWAD

$V_{RW} = \pi \frac{RW_{DIAM}^2}{4} L_{RW} (1+\eta)$

$= \pi (6)^2/4 (2)(.9) = 51 \text{ FT}^3$

η = POROSITY OF ROOTWAD ASSUME 10% (LOW)
L_{RW} = LENGTH ROOTWAD ASSUME 1'

$V_{TREE} = \pi (TREE_{DIAM}/2)^2 L_{TREE}$
$= \pi (3/2)^2 (8-2) = 42 \text{ FT}^3$

ASSUME ENTIRE TREE & ROOTWAD IS SUBMERGED

GRAVITY: $F_G = (V_{RW} + V_{TREE}) \rho_T$
$= (51 + 42)(22)$
$= 2046 \text{ LB}$

ρ_T = DENSITY TREE
= 22-33 LB/FT³ CEDAR-FIR

BUOYANCY: $F_B = (V_{RW} + V_T) \rho_W$
$= (51 + 42)(62.4)$
$= 5803 \text{ LB}$

$\rho_W = 62.4 \text{ LB/FT}^3$

FACTOR OF SAFETY = $\frac{F_G}{F_B} = \frac{2046}{5803} = 0.40$

SHOULD BE 1.5 MIN

MIN OKAY BECAUSE WILL PROBABLY NEVER BE FULLY SUBMERGED

Reference

NEED TO ADD BALLAST OF (5803)(1.5) − 2046 = 6659

UNIT WEIGHT CONCRETE = 150 LB/FT³

BLOCK = 150 PCF − 62.4 PCF = 87.6 PCF

VOL = 6659 / 87.6 = 76 FT³ SEEMS AWFULLY

TWO ANCHORS ⇒ VOL = 38 FT³ LARGE!

BLOCKS SHOULD BE 6'x2'x3.2' EACH! SO BIG!

DRAG: $F_D = \frac{V^2}{2g} AREA_{RW} \rho_W C_D$ g REQ'D BECAUSE NOT USING SLUGS IN ρ

$= \frac{5^2}{2(32.17)} \pi(3)^2(62.4)(1.2)$ $C_{D_{RW}}$ FROM TN-15

V = VELOCITY

= 823 LB

LIFT: $F_L = \frac{V^2}{2g}(V_{RW} + V_T)\rho_W C_L$ $C_L = 0.18$ FROM TN-15

$= 5^2/2/(32.17)*(51+42)(62.4)(.18)$

= 406 LB

FORCE BALANCE & MOMENT

M_O: $F_{N_T}(L\cos\theta + X) + F_B X + F_L X = (F_G + WT_{BALLAST})X + F_D(\frac{2}{3}d)$

X = DISTANCE TO CG (FROM PAGE 1) = 1.25

d = DEPTH OF WATER, SAY 2' ABOVE ROOTWAD = 8'

$F_{N_T}(6\cos 23.5 + 1.25) + (5803)(1.25) + 406(1.25)$

$= (2046 + 6659)(1.25) + 823(\frac{2}{3}8)$

$F_{N_T}(6.75) + 7254 + 507.5 = 10881 + 4389$

$F_{N_T} = 1112$ LB

F_Z: $F_D \sin\theta + (F_G + WT_{BALLAST}) = F_B + F_L + F_{N_T} + F_{N_{RW}}$

$823\sin 23.5 + 2046 + 6659 = 5803 + 406 + F_{N_T} + F_{N_{RW}}$

$9033 = 6209 + F_{N_T} + F_{N_{RW}}$

$F_{N_{RW}} = 2824 - F_{N_T}$ F_{N_T} FROM M_O

$= 2824 - 1112 = 1712$ LB

Job _____ Project No. _____ Sheet ____ of ____

Description LOG ANCHORING Computed by _____ Date _____

Checked by _____ Date _____

Reference

FRICTION: $F_{\mu T} = F_{NT}\,\mu_{BED} = 1112\,(0.9)$ $\mu = 0.9$ FOR GRAVEL/BOULDERS (PER SHRG)

$F_{\mu T} = 1001$ LB

$F_{\mu RW} = F_{NRW}\,\mu_{BED} = 1712\,(0.9)$

$F_{\mu RW} = 1541$ LB

FACTOR OF SAFETY - MOMENTUM

$FS = (F_{\mu T} + F_{\mu RW}) / F_D \cos\theta = (1001 + 1541) / 823 \cos 23.5$

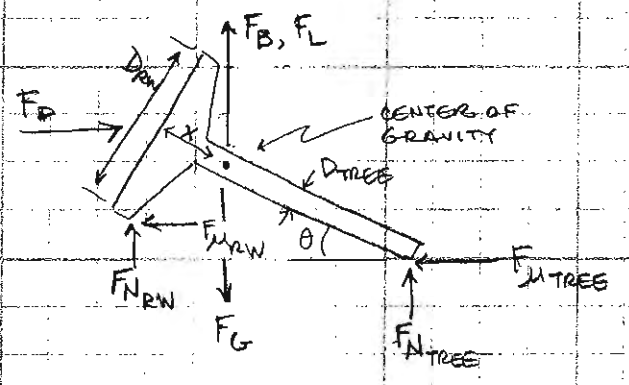
$FS_M = 3.37$

FACTOR OF SAFETY BUOYANCY

$FS = (F_G + WT_{BALLAST} + F_D \sin\theta) / (F_B + F_L)$

$= (2046 + 6659 + 823 \sin 23.5) / (5803 + 406)$

$FS_B = 1.45$



N = NORMAL
μ = FRICTION
B = BUOYANCY
L = LIFT
G = GRAVITY
D = DRAG

X = DIST TO CG
θ = ANGLE OF BOLE
RW = ROOTWAD
D = DIAM

REFERENCES

ISPG = INTEGRATED STREAMBANK PROTECTION GUIDELINES - APPENDIX E - HYDRAULICS BY WDFW

HEC-20 = FHWA STREAM STABILITY AT HIGHWAY STRUCTURES PUBLICATION FHWA NHI 01-002

HEC-18 = FHWA EVALUATING SCOUR AT BRIDGES PUBLICATION FHWA NHI 01-001

NRCS 210-VI-EFH PART 650 CHAPTER 16 STREAMBANK AND SHORELINE PROTECTION

HEC-15 = FHWA DESIGN OF ROADSIDE CHANNELS WITH FLEXIBLE LININGS PUBLICATION FHWA IP-87-7

SOILS BOOK = INTRODUCTION TO GEOTECHNICAL ENGINEERING, BY HOLTZ & KOVACS

SHRG = STREAM HABITAT RESTORATION GUIDELINES BY WDFW

NRCS = TECHNICAL NOTE 15 BY IDAHO NRCS (SAMPSON & CASTRO) INCORPORATION OF LARGE WOOD INTO ENGINEERING STRUCTURES

APPENDIX C

Field Forms

DAILY FIELD REPORT

URS CORPORATION Century Square 1501 4th Avenue, Suite 1400 Seattle, WA. 98101-1616 Tele: (206) 438-2700 Fax: (206) 438-2699	**Date:**	**Job No. 33758302.06000**
	Project: Boeing Everett PMC Sediment Interim Action	
	Location: Boeing Everett North Complex, Powder Mill Gulch Stormwater Facilities, Headwaters of Powder Mill Creek	
To:	Owner: Boeing Commercial Airplanes	Contractor:
	Weather:	Page 1 of
	Field Engineer:	**Report Sequence # 01**

URS ACTIVITIES

CONTRACTOR ACTIVITIES

OBSERVATIONS

CONVERSATIONS

CONCLUSIONS

Copies to:	DAILY FIELD REPORT Signed:

Sampling Record

Client: _____ Job Number: _____

Location: _____ Sampled By: _____

Site Name: _____

Date and Time: _____

Sample Classification

Soil: ☐ Water: ☐ Excavation: ☐

Boring: ☐ Surface Water: ☐ Pipe Outfall: ☐

Sediment: ☐ Groundwater/Seep: ☐ Other: _____

Sampling Method

Direct Fill Container: ☐ Peristaltic Pump: ☐ Hand Auger: ☐

Remote Fill: ☐ Bailer: ☐ Core Sampler: ☐

Dipper Jar/Can: ☐ D&M Sampler: ☐ Split Spoon: ☐

Positive Displacement Pump: ☐ Stainless Spoon/Trowel: ☐ Other: _____

Sample Type

Point: ☐ Grab: ☐ Composite: ☐

Sample Information

Sample ID: _____ Sample Depth: _____

Sample Treatment: _____

Sample Condition: _____

_____

_____

Field Tests (record units)

Temperature: _____ Dissolved Oxygen: _____

Conductivity: _____ Iron: _____

pH: _____ PID: _____

Other: _____

Laboratory Information

Laboratory Analyses: _____

Number of Containers and ID: _____

Field Blank ID: _____

Trip Blank ID: _____

Duplicate Sample ID: _____

Comments: _____

_____

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Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page:	of
ARI Client Company:	Phone:	Date:	Ice Present?
Client Contact:		No. of Coolers:	Cooler Temps:
Client Project Name:			
Client Project #:	Samplers:		

Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Sample ID	Date	Time	Matrix	No. Containers	Analysis Requested								Notes/Comments

Comments/Special Instructions	Relinquished by: (Signature)	Received by: (Signature)	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name:	Printed Name:	Printed Name:	Printed Name:
	Company:	Company:	Company:	Company:
	Date & Time:	Date & Time:	Date & Time:	Date & Time:

Limits of Liability: *ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.*

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.

TABLE OF CONTENTS
FOR SPECIFICATIONS

SECTION 01110

SUMMARY OF WORK

PART 1 GENERAL

1.01 DESCRIPTION

A. This section provides a brief narrative summary of the contract work. This summary does not provide the technical detail of the work activities, but describes the work as a whole, providing overall perspective to the separate tasks. Background on site conditions and previous investigations is also included. This section shall be used in conjunction with all the other sections and the Drawings to establish the total work requirements.

1.02 WORK COVERED BY CONTRACT DOCUMENTS

A. Contractor is advised that the contract work will consist of an interim remedial action within Powder Mill Creek (PMC) at the north perimeter of the Boeing Everett Facility located in Everett, Washington. The interim remedial action will be conducted under the purview of the Model Toxics Control Act, under an Agreed Order between the Washington State Department of Ecology and The Boeing Company (Owner). Contractor shall adhere to all applicable Federal, State, and local regulations.

B. Under this contract work, streambed sediment containing PCBs within the headwaters reach of PMC will be removed to reduce the potential for mobilization and downstream transport of PCBs. Sediment removal shall be performed in the first 120 feet of creek downstream of the Stormwater Detention Basin stilling basin, over the entire width of the creek bed, to a nominal depth of 12 inches. The excavation is deeper in areas designated on the Drawings, however, excavation depths are limited to a maximum of about 2.5 feet. The removal dimensions are based on analytical results of sediment samples indicating that a substantial percentage of the PCB mass in creek sediments is present within these dimensions.

C. Sediment to be removed is present in the project reach as loose sand and gravel and as infill between large riprap boulders. Sediment removal shall be performed using excavation equipment, vacuum truck extraction, pressure washing, or hand excavation, as needed. One access point for heavy equipment shall be created in the western bank at the head of the creek and all sediment shall be moved to that access point by in-creek equipment and then transported from the creek directly into roll-off units located at the creek bank. The access road shall remain in place at the end of the contract.

D. The sediment shall be allowed to free drain within the creek to the extent possible prior to transport out of the creek, to minimize the possibility for contaminant distribution outside of the creek. Additional sediment dewatering shall occur in the roll-off units, which shall be equipped with drainage nets and geotextile filter fabrics. After a roll-off unit is filled it shall be transported to a temporary storage area, which shall be equipped with secondary containment. If a vacuum truck is used to transport sediment out of the creek, the contents of the vacuum truck shall be transferred to roll-off units within the secondary containment of the temporary storage area. Once the sediment has fully dewatered, Owner will dispose of the water and sediment in the roll-off units using the processes being used to dispose of

flightline PCB waste. Disposal of contaminated sediment is not part of the contract work. Contractor shall return to the site to remove the secondary containment.

E. Water within the project reach shall be collected in a shallow sump dug at the downstream end of the work area. Water may include wash water used to dislodge sediment, seepage from the draining sediments being removed, and groundwater that enters the excavation. The water shall be collected, treated, tested, and discharged to the Everett POTW at a manhole located in the project area.

F. Confirmation sediment samples will be collected by Engineer from the bed of the creek following sediment removal. Sampling is not part of the contract work. After approval of the results of this sampling, the creek shall be restored by Contractor with habitat-appropriate materials (e.g., fish-mix gravel, woody debris) and structures designed to optimize stream hydraulics in this reach. Anchoring of some restoration features will require some additional excavation at certain locations. Excavated material shall be handled as though it were contaminated

G. During construction, PMC downstream of the work area and nearby surface water bodies shall be protected using construction BMPs for stormwater management. New cut slopes required to construct the creek access shall be covered with a rolled erosion control product and hydoseeded when grading is complete. PMC downstream of the work area shall be isolated from the work area. PMC in the work area and immediately downstream is not expected to be flowing at the time of the work. A contingency plan shall be in place in the event of an unexpected storm that results in surface water flow within the project reach.

H. The contract work includes returning to the site during an appropriate season to complete planting, remove secondary containment in the temporary storage area, and remove the sand bag decant weir installed to protect downstream reaches of PMC. The contract work includes warranty and maintenance of plantings for a 1-year period following construction acceptance.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01145

SITE-SPECIFIC REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION

A. This section provides general Site-Specific Requirements which shall be observed by the Contractor during performance of work for the duration of the Contract.

1.02 CONDUCT OF WORK

A. Coordination

1. Coordination with agencies, other on-site contractors, and Owner, shall generally be made by Contractor through Engineer to assist Contractor with performance of the work with a minimum of interference and inconvenience. Badging of Contractor's personnel will require direct coordination between Contractor and Owner. All activities shall use the main entry gate for access, and this gate is normally not locked by Owner.

2. The project site is located on property occupied by active stormwater facilities operated by Owner. All activities shall be coordinated with on-going Owner activities and not interfere with these activities except with written approval of Engineer.

B. Work Hours

1. Work hours in the project area shall be 7:00 a.m. to 6:00 p.m. daily, Monday through Saturday, excluding holidays. Requests for alternate work schedules may be considered, but must be approved by the Engineer. Alternate work schedules may not be approved if the Owner's Representative is not available to be on site during the proposed work hours.

C. Potential Storm Hazard

1. The Powder Mill Creek work site is subject to potential large discharges of water during or directly following storm events. Contractor's personnel shall be made aware of this potential hazard. Coordinate with Engineer in the event that significant water accumulates in the stormwater detention basin upstream of the work area and comply with provisions of Paragraph 1.05 Storm Contingency Plan. Avoid subjecting personnel to potential hazards from significant stormwater discharge to Powder Mill Creek.

1.03 GENERAL ACCESS REQUIREMENTS

A. The project site area is secured by a single gate, which is normally not closed or locked by Owner. The project site area is periodically patrolled by Owner's roving security details and security personnel may query personnel working at the site and ask for identification issued by Owner.

B. Badging of Personnel

1. Contractor shall be responsible for obtaining identification badges from Owner for each employee, and for requiring each employee engaged on the work to display the identification badge while Owner's property. Owner-supplied identification shall immediately be returned to the Owner for cancellation upon release of any employee. Delivery drivers and other personnel typically on site for less than one full day (in aggregate) during the course of the project are exempt from this requirement, provided that such personnel are accompanied by badged Contractor personnel at all times while on Owner's property. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

C. Badging Procedure

1. The Badge Request Form attached to this Section must be filled out for each of Contractor's employees that qualify for badging under paragraph 1.2.1 BADGING OF PERSONNEL. Completed Badge Request Forms shall be submitted by Contractor a minimum of 10 business days before the badge is required, to Owner's Representative listed below. Owner's Representative shall act as the "sponsor" for Contractor's personnel, as required on the Badge Request Form:

   Alan Sugino
   BCA Everett Environmental Affairs
   P.O. Box 3707, MC OP-88
   Seattle, WA 98124-2207
   alan.k.sugino@boeing.com
   (425) 266-8173

2. Contractor's personnel shall appear individually at the Badging Office and present original identification documents as described on the Badge Request Form to receive a badge.

D. Irregular or Non-Routine Access

1. Access on an irregular basis and during other than established working hours will require prior approval by Engineer.

E. Maintenance of Access

1. Contractor shall not obstruct or interfere with access by others to existing facilities adjacent to the project site during the work under this Contract.

F. Vehicle Parking

1. Contractor's vehicles shall only park in approved areas as shown on the Drawings and in accordance with Section 01500 TEMPORARY CONSTRUCTION FACILITIES.

1.04 COORDINATION AND COOPERATION WITH OTHER CONTRACTORS

A. Work by others may be performed in the vicinity of or adjacent to the project site in concurrence with the scheduled performance of the Work under these Contract Documents. Contractor shall coordinate construction work with Landau Associates, their subcontractors, and other contractors to minimize conflicts and to maintain a cooperative effort in completion of the Work. The primary point of contact for Landau Associates is Jerry Ninteman, telephone (425) 788-0907, fax (425) 788-6409, at the following address:

Landau Associates
130 2nd Avenue South
Edmonds, Washington 98020

1.05 CONSTRUCTION SCHEDULE REQUIREMENTS

A. Work Flow

1. The work shall be planned, scheduled, and performed to complete the Work within the requirements of these Contract Documents and the requirements of appropriate Federal, State, and local agencies. Contractor shall prepare and maintain a construction schedule. Work shall be completed within the timeframe of August 1, 2006 to September 30, 2006, except for follow-up work that includes removal of the decant weir, replanting, removal of secondary containment, and maintenance of plants for 12-months.

B. Sequence of Work

1. Pre-construction badging and submittals.
2. Mobilization of personnel, equipment, materials, and supplies.
3. Site preparation, including temporary erosion and sediment control measures.
4. Construct secondary containment at Excavated Material Temporary Storage Area.
5. Install Temporary Construction Dewatering Water Storage, Treatment, and Discharge System.
6. Prepare roll-off units with drainage nets.
7. Install decant weir.
8. Install additional required erosion and sediment control.
9. Clear access to creek bed.
10. Prepare access road to creek bed.
11. Install rolled erosion control product and hydroseed access road slopes.
12. Clear creek bed.

13. Cut and remove vegetation in creek bed.

14. Remove, contain in roll-off units, and store contaminated sediment, moving and washing loose riprap as required and controlling water as necessary.

15. Await confirmation sampling and approval to restore creek by Engineer.

16. Place large woody debris, large rock, and other restoration materials in creek bed.

17. Place rolled erosion control product and hydroseed portions of creek bed.

18. Cleanup and demobilize staging and remaining work areas.

19. Return to demolish sandbag decant weir and secondary containment, and plant restoration vegetation.

20. Maintain plantings for 12-months.

C. Schedule Constraints

1. The following special constraints have been identified as having an impact on the performance of the work. It is not intended to be a comprehensive list of constraints that will result from the execution of the work, but as an aid to Contractor in development of schedules and in executing the work. Additional constraints may exist or develop as a result of required work execution or Contractor's proposed work methods or sequence. In any event, Contractor is responsible for compliance with the requirements of the various specification sections and the work procedures and protection requirements contained therein and establishing all constraints associated with the work execution and incorporating them into work schedules and proposed construction activities.

   a. Contractor shall schedule the sediment removal work to minimize time spent in the creek bed with loose, contaminated sediment present. Unexpected storm events could result in sudden high water flow in the work area that could mobilize piled and loose contaminated sediment with the potential to have deleterious effects downstream. Contractor shall schedule sediment removal work with local weather forecasts in mind, choosing a work window when storm events are unlikely. Contractor shall expedite removal of contaminated sediment from the creek, such that unexpected storm events, if they occur, result in flow through a cleaned creek bed.

   b. Unexpected storm events may cause the Contractor to evacuate material, equipment, and personnel from the creek bed. Contractor shall be prepared to implement the Storm Contingency Plan described in paragraph 1.05 STORM CONTINGENCY PLAN. Part of this plan requires coordination with Owner's facility personnel such that work is conducted when the Stormwater Detention Basin has maximum capacity to receive and hold stormwater.

1.06 STORM CONTINGENCY PLAN

A. Potential Impact of Unexpected Storm Events

1. Scheduling of the work during the dry season and in consideration of local weather forecasts is expected to minimize the chance of stormwater entering the project reach from the Stormwater Detention Basin discharge pipe or spillway during construction. An unexpected storm event could, however, cause flow in the project reach. If such flow occurs during contaminated sediment removal, loose and piled sediment could be mobilized. Contractor's personnel shall be familiar with the normal operation of the Stormwater Detention Basin, as described in the Basis of Design Report. Normal operation of the Stormwater Detention Basin shall also be a topic at the on-site Preconstruction Meeting. Contractor shall prepare for unexpected storm events in accordance with Contractor's Storm Contingency Plan, required for submittal under Section 01560 CARE AND DIVERSION OF WATER.

B. Work Scheduling to Avoid Flow in Project Reach

1. Contractor shall schedule work in accordance with paragraph 1.04C Schedule Constraints to minimize the potential for stormwater to enter the project reach during contaminated sediment removal operations.

C. Maximizing Stormwater Detention Basin Holding Capacity

1. Under normal operating conditions, as described in the Basis of Design report, the Stormwater Detention Basin retains water to a depth of 8 feet to facilitate settling of solids. Under normal operation, storm events cause flow from the Stormwater Detention Basin discharge pipe to the extent that water rises above 8 feet in the basin. Flow from the Stormwater Detention Basin can begin within a few hours of the inception of rain anywhere within the catchment of the Powder Mill Gulch stormwater system. To maximize the time available to the Contractor from the inception of rain to flow beginning in the project reach, the following shall be coordinated with the Engineer:

a. Contractor shall make every effort to schedule the work to occur immediately after the normal annual draining and cleaning of the Sedimentation Basin and Stormwater Detention Basin. This procedure is conducted yearly by the Owner's facility department during the dry season, and results in clean, empty basins with maximum holding capacity.

b. Contractor shall confirm with Engineer the exact start date for work within Powder Mill Creek 7 calendar days in advance, and shall request that Owner pump any accumulated water from the Stormwater Detention Basin to the Sedimentation Basin, thereby maximizing the capacity of the Stormwater Detention Basin.

c. Contractor shall request that Owner temporarily close, lockout, and tagout the discharge valve from the Stormwater Detention Basin, preventing flow to the project reach. During the period that the valve is closed, Contract shall monitor via visual observation the water depth in the Stormwater Detention Basin.

Contractor shall inform Engineer if water begins to accumulate in the Stormwater Detention Basin, and will update Engineer at each 5-foot increase in water level.

d. At the onset of rain events during periods of work in the creek bed, Contractor shall follow the procedures set forth in paragraph 1.05D Securing and Evacuating the Creek.

D. Securing and Evacuating the Creek

1. Prior to the start of intrusive work in the creek bed, sufficient protective geotextile and filled 30-pound sand bags shall be moved to within 25 feet of the creek bed to protect the creek bed in the case of a rain event. Contractor shall provide sufficient geotextile to cover the lateral limits of sediment removal shown on the Drawings, plus 5-feet in all dimensions. If a rain event begins while Contractor is conducting work within Powder Mill Creek, Contractor shall begin continuous visual observation of the water depth in the Stormwater Detention Basin. Contractor shall begin evacuation of the creek at the inception of rain. Contractor shall roll out and secure a durable geotextile (as specified in Section 02111 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL, paragraph 2.03) over the creek bed in the project reach to minimize sediment mobilization if flow begins. Dig in upstream end of geotextile beneath stilling basin outflow pipes. Weight down geotextile with minimum 30-pound sandbags placed at 10-foot centers throughout the reach. Place additional sandbags or other weight as needed to fully secure geotextile during storm event.

E. Protection of Downstream Reaches

1. At the beginning of work in the creek Contractor shall install the decant weir in accordance with Section 01410 ENVIRONMENTAL PROTECTION. This weir is intended to minimize downstream turbidity in the event of unexpected flow in the project reach during construction.

1.07 PROTECTION OF PROPERTY

A. Contractor shall protect all property within or in the vicinity of the work site. Contractor shall ensure that it is not removed, damaged, destroyed, or prevented from its normal use unless so designated in the Contract Documents. All property adjacent to the work shall be protected including, but not be limited to, protection from construction generated dust, debris, water, and vibration. Property includes land, utilities, landscaping, markers and monuments, monitoring wells, buildings, structures, site and drainage improvements, and other improvements, whether shown on the Drawings or not. No work shall be conducted in any wetlands shown on the Drawings and restricted areas unless coordinated with and approved by Engineer.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01310

PRECONSTRUCTION MEETING

PART 1 GENERAL

1.01 DESCRIPTION

A. Not more than 5-days after a Notice to Proceed has been issued to the Contractor, but earlier if practicable, a mandatory preconstruction meeting will be scheduled by the Engineer.

B. The Engineer will preside at the Preconstruction Meeting.

C. Present to represent the Contractor shall be at least the official in charge of the project, the project superintendent, a representative with authority to speak for each of his principle subcontractors, and other representatives as he may deem expedient.

D. The Owner and other invited parties shall be present as required.

E. Proceedings of meeting will be recorded and distributed to interested parties.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Summary of Work: Section 01010

B. Site-Specific Requirements: Section 01145

C. Measurement and Payment: Section 01025

D. Progress Meetings: Section 01320

E. Submittal Procedures: Section 01330

F. Hazardous & Contaminated Substance Health & Safety Program: Section 01351

1.03 AGENDA

A. Both Owner and Contractor shall be prepared to speak to the following:

1. Name and Field Address of Job Superintendent

2. Emergency Phone and/or operator

3. Date of Construction Start

4. Date of Notice to Proceed

5. Notification of Utilities Concerned, Fire, Police, Schools, etc.

6. Coordination with other contractors
7. Permits: County, City, State Fisheries, Government Agencies as required
8. Inspector: name, authority
9. Field office (location)
10. Submittals
11. Responsibility for lines and grades
12. Periodic monthly payments including date for submittal
13. Construction progress schedule (bar graph or C.P.M.)
14. Safety Requirements and Special Hazards
15. Insurance and Bonds
16. Traffic Control
17. Construction Signs
18. Drawings revised to conform to construction records
19. Beneficial occupancy
20. Retention of Contract records
21. Guarantees and warranties
22. Testing
23. Progress Meetings
24. Complaint Procedure
25. Job Photos
26. Other matters concerning construction

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01320

PROGRESS MEETINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Weekly Progress Meetings will be held at the job site during construction.

B. The Engineer will preside at Progress Meetings

C. Proceedings of meeting will be recorded and distributed to interested parties.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Summary of Work: Section 01010

B. Preconstruction Meetings: Section 01310

C. Field Engineering: Section 01720

D. Record Drawings: Section 01780

1.03 MEETINGS

A. Meetings will be scheduled each week at mutually agreed time.

B. Location of meetings: As designated during preconstruction conference.

C. Attendance:

1. Engineer
2. Owner (optional)
3. Contractor
4. Other contractors (if any).
5. Subcontractors as pertinent to agenda.
6. Safety Representative (Optional).
7. Representatives of Governmental or other Regulatory Agencies.

1.04 MINIMUM MEETING AGENDA:

A. Review, approve minutes of previous meeting.

B. Review work progress since last meeting.

C. Note field observations, problems and decisions.

D. Identify problems which impede planned progress.

E. Develop corrective measures and procedures to regain planned schedule.

F. Revise Construction Schedule as indicated.

G. Plan progress during next work period.

H. Coordinate projected progress with other contractors.

I. Review submittal schedules, expedite as required to maintain schedule.

J. Maintaining of quality and work standards.

K. Review proposed changes for:

1. Effect on Construction Schedule

2. Effect on Completion Date

L. Complete other current business.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION

SECTION 01330

SUBMITTAL PROCEDURES

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes specifications for the general requirements and procedures for preparing and submitting construction information and data for information and review. Other requirements for submittals are specified under applicable Sections of the Specifications.

B. Submittals are as specified throughout the Contract Documents.

1.02 SUBMITTAL REQUIREMENTS

A. Schedule of Submittals: Within 10 calendar days after the effective date of Notice to Proceed, Contractor shall submit a completed submittal schedule and list of products for all items requiring Engineer's review, as follows:

1. Workplan, Shop Drawing, or other Submittal identification including description of the item. Include name of manufacturer, trade name, and model number, if applicable.

2. Specification section references.

3. Intended submission/resubmission date(s).

4. Order release date.

5. Lead time to delivery/anticipated delivery date(s).

6. Highlight items that require expedited review to meet the project schedule, and are on the critical path.

B. These schedules shall be presented in a form that is readily reproducible and shall be updated and sent to Engineer on a bi-weekly basis (twice per month). Identify all submittals that are required by the Contract Documents and determine the date on which each submittal will be submitted.

C. Professional Seal Required: Submittals involving engineering expertise, such as excavation support structures, and load calculations, shall be sealed and signed by a professional engineer, currently registered in the State of Washington, for the discipline involved.

D. Review Stamp and Action Block Space: Include a 5-inch square blank space, in the lower right corner, just above the title block, in which Engineer may indicate the action taken.

E. Review Period:

1. Prepare submittals sufficiently in advance so that review may be given before commencement of related work.

2. Allow 10 calendar days after receipt by Engineer for review of each submittal.

3. Contractor shall be responsible for determining whether or not certain submittals require longer review periods. Where longer review periods are required, Contractor shall schedule the Work accordingly, so that the Work and construction schedules are not adversely impacted.

F. Submittal Delivery: Ship submittals prepaid or deliver by hand directly to Engineer.

G. Transmittal Form: Accompany submittals with the transmittal forms provided by Engineer.

H. Changes in Reviewed Submittals: Changes in reviewed submittals will not be permitted unless those approved submittals with changes have been resubmitted and reviewed, in the same manner as the original submittal.

I. Supplemental Submittals: Supplemental submittals initiated by Contractor for consideration of corrective procedures shall contain sufficient data for review. Make supplemental submittals in the same manner as initial submittals.

J. Incomplete submittal packages will be returned without review.

1.03 CONTRACTOR'S RESPONSIBILITIES

A. Contractor's Review:

1. Each submittal shall be reviewed, stamped, and signed as reviewed and approved by Contractor prior to submission.

2. If the submittal is designated to be sent to Engineer for information, approval by the designated approval authority shall take place before submission to Engineer.

3. Contractor shall coordinate each submittal with the requirements of the Work, placing particular emphasis upon ensuring that each submittal of one trade is compatible with other submittals of that trade and with the submittals of other trades. Ensure submittal is complete with all relevant data required for review.

4. Review of drawings and associated calculations by Engineer shall not relieve Contractor from the responsibility for errors or omissions in the drawings and associated calculations, or from deviations from the Contract Documents, unless submittals containing such deviations were submitted to Engineer and the deviations were specifically called to the attention of Engineer in the letter of transmittal, and approved by Engineer as a Contract change.

5. Contractor's liability in case of deviations in the submittals from the requirements of the Contract Documents, is not relieved by Engineer's review of submittals containing deviations, unless Engineer expressly approves the deviations by issuing a Change Order.

6. Contractor shall be responsible for the correctness of the drawings, for shop fits and field connections, and for the results obtained by the use of such drawings.

B. Submittal Quantities: Unless noted otherwise, Contractor shall submit three copies of all submittals. Where permits and licenses and other such documents are obtained in Owner's name, submit the original and five copies.

C. Distribution of Submittals after Review: Distribute prints or copies of reviewed submittals, bearing Engineer's or designated approval authority's stamp and signature, to affected and concerned subcontractors, suppliers, and fabricators; and to affected and concerned members of Contractor's workforce.

D. Maintain at the site of the work a complete up-to-date, organized file of all past and current submittals including an index and locating system which identifies the status of each submittal:

1. Assign a sequential number to each submittal.

2. Assign a revision number, using an alphanumeric sequence (i.e. 15, 15A, 15B, etc.) to all submittals.

1.04 ENGINEER'S REVIEW

A. Submittals will be reviewed for conformance with requirements of the Contract Documents. Review of a separate item will not constitute review of an assembly in which the item functions. Review will not relieve Contractor from Contractor's responsibility for accuracy of submittals, for conformity of submittals to requirements of Contract Documents, for compatibility of described product with contiguous products and the rest of the system, or for prosecution and completion of the Contract in accordance with the Contract Documents.

B. Engineer will indicate its reviews of submittals and the action taken by means of its review stamp. The review stamp will be affixed by Engineer, the action block will be marked, and the stamp will be signed and dated.

C. The review-stamp action-block marks will have the following meanings:

1. The mark NO EXCEPTIONS TAKEN means that every illustration and description appears to conform to the respective requirements of the Contract Documents; that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed; and that the submittal need not be resubmitted.

2. The mark EXCEPTIONS AS NOTED - RESUBMISSION NOT REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents upon incorporation of the reviewer's corrections, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed. Submittals so marked need not be resubmitted unless Contractor challenges the reviewer's exception.

3. The mark EXCEPTIONS AS NOTED - RESUBMISSION REQUIRED means that every illustration and description appears to conform to the respective requirements of the Contract Documents, and that fabrication, assembly, manufacture, installation, application, and erection of the illustrated and described product may proceed after incorporation of the reviewer's corrections and verification by Engineer that the reviewer's corrections have been properly incorporated in the submittal. Resubmission is also required if Contractor challenges the reviewer's corrections.

4. The mark REJECTED means that the submittal is deficient to the degree that the reviewer cannot correct the submittal with a reasonable degree of effort, has not made a thorough review of the submittal, and that the submittal needs revision and is to be corrected and resubmitted.

D. Contractor shall attend meetings as requested by Engineer to address issues related to the review of submittals.

E. Engineer will return submittals to Contractor within 10 calendar days after submittals have been received.

F. Contractor shall include 10 calander days in its schedule for Owner and other parties to review submittals and re-submittals.

G. No schedule extensions will be permitted for poorly prepared, incomplete, or inaccurate submittals.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION

SECTION 01351

HAZARDOUS AND CONTAMINATED SUBSTANCE HEALTH AND SAFETY PROGRAM

PART 1 GENERAL

1.01 DESCRIPTION

A. This Section includes specifications for the preparation and implementation of a Project-Specific Health and Safety Plan (HASP). The HASP will establish in detail the protocols necessary for protecting workers, on-site personnel, visitors, potential off-site personnel, and the public from potential hazards that may be encountered during removal, excavation, stockpiling, handling, sampling, transportation, and disposal of contaminated soils, water, and other debris. Contractor will prepare a Project-Specific HASP that, at a minimum, will address employee training, equipment maintenance inspection and operation, excavation safety, lock-out/tag-out procedures, site control, housekeeping, personal protective equipment (PPE), and emergency procedures. The HASP completed by Contractor is supplemental to Engineer's Company Safety and Health Program. It is not the intent of Engineer or Owner to develop or manage the safety and health programs of Contractor, its Subcontractors, or supplies, or in any way assume the responsibility for the safety and health of their employees.

B. Contractor shall review other sections on hazardous and contaminated material for their respective health and safety requirements.

1.02 REFERENCE STANDARDS

A. National Institute for Occupational Safety and Health (NIOSH)

1. NIOSH Occupational Safety and Health Guidance for Hazardous Waste Site Activities

1.03 REGULATORY REQUIREMENTS

A. Code of Federal Regulations (CFR)

1. 29 CFR 1910 OSHA General Health and Safety Standards
2. 29 CFR 1926 OSHA Construction Safety and Health Standards
3. 40 CFR 300 Emergency Planning and Community Right-to-Know

B. Washington Administrative Code (WAC)

1. Chapter 296-27 WAC Record Keeping and Reporting
2. Chapter 296-24 WAC Washington General Safety and Health Standards
3. Chapter 296-62 WAC Washington General Occupational Health Standards

4.	Chapter 296-155 WAC	Washington Safety Standards for Construction Work
5.	Chapter 296-800 WAC	Core Safety Rules
6.	Chapter 296-824 WAC	Emergency Response
7.	Chapter 173-303 WAC	Dangerous Waste Regulation
8.	Chapter 173-340 WAC	Model Toxics Control Act – Cleanup

1.04 DEFINITIONS

A. Certified Industrial Hygienist (CIH) – A trained specialist accredited by the American Board of Industrial Hygiene with at least 5 years experience in hazardous material processing and working knowledge of selection and use of personal protective equipment (PPE), air monitoring, regulations, and other health and safety issues.

B. Site Safety and Health Officer (SSHO) – A trained specialist in health and safety with minimum 3 years experience and working knowledge of use of PPE, regulations and hazard identification.

1.05 GENERAL REQUIREMENTS

A. Perform work required by the Contract in a safe and environmentally acceptable manner for the duration of the Contract.

B. Maintain a current Company Safety and Health Program and a Project-Specific HASP conforming to applicable Federal, State, and Local statutes, rules, regulations, and ordinances, in effect at the time the work is performed.

C. Personnel working in hazardous or contaminated material areas shall be trained in accordance with applicable regulatory requirements and thoroughly briefed on the anticipated hazards, safety equipment to be employed, safety practices to be followed, and emergency procedures and communications.

D. Adhere to applicable Federal, State, and Local statutes, rules, regulations, and ordinances for the duration of the Contract.

E. Maintain on the project site an inventory of hazardous materials brought to the site along with current Material Safety Data Sheets (MSDS) for each product.

F. Immediately notify Engineer of all emergency conditions including work related injuries or illness, accident causing property damage, spill, leaks, or discharges of hazardous or potentially hazardous materials, complaints or problems with client personnel or members of the public, and near-miss events that could result in any of aforementioned the events listed in this paragraph.

G. All products and materials used in connection with this Work shall remain asbestos-free.

H. Immediately notify Engineer if, during the course of the Contract, there should be a discovery of any undetermined substance.

1.06 SUBMITTALS

A. Quality Assurance/Control

1. Submit the Project-Specific HASP for review and comment by Engineer within 15 calendar days from Notice to Proceed.

2. Provide current certifications for worker training, medical monitoring, and respirator use (if applicable).

B. Reports

1. Daily equipment inspection reports, and daily tail-gate safety meeting minutes,

2. Work related injury/illness reports, accident reports, near miss reports, accident reports

1.07 QUALIFICATIONS, RESPONSIBILITIES AND TRAINING

A. Qualifications

1. Contractor personnel assigned for the purpose of performing or supervising hazardous materials work in accordance with the provisions of the Project-Specific HASP, above Level D protection, shall have received appropriate safety training in compliance with 29 CFR 1910.120, 29 CFR 1910.134, and WAC 296-62-300. Minimum of forty (40) hours hazardous waste operations health and safety training, twenty-four (24) hours of "on the job" training, eight-hours annual refresher training and annual medical monitoring by an occupational physician is required. Minimum of eight-hours additional specialized training in managing hazardous waste operations and current certification in first aid and cardiopulmonary resuscitation (CPR) is required for supervisory personnel. Workers without current certification shall not be allowed to enter the Exclusion Zone.

2. Comply with the medical surveillance program requirements of OSHA standard 29 CFR 1910.120, 29 CFR 190.134, and WAC 296-62-300. Provide documentation that personnel have received medical examinations and are certified for respirator use (if necessary), within the last 12 months, and are cleared to work on hazardous sites before entering an Exclusion Zone or contacting hazardous materials.

3. Safety Briefings: Contractor personnel will attend a preconstruction safety briefing, daily and weekly health and safety tailgate meetings, and other topic specific health and safety briefings should the need arise.

1.08 ACCIDENTS

A. Provide such equipment and facilities as are necessary or required, in the case of accident, for first aid service to any who may be injured in the progress of the work. Have a standing

arrangement for the removal and hospital treatment of any person who may be injured or may become ill.

B. Report immediately to Engineer and the Owner's Emergency number every accident, illness or injury to persons or damage to property; and furnish the required reports in writing within the times specified. An accident, injury, or illness is any occurrence that results in a bruise, breaking the skin, or loss of time of more than 15 minutes of work time; an impairment of vision or mobility; or that adversely affects job performance as a result of contact with equipment, material, vapors, lighting, liquid, or solid materials. The report shall include full information, including testimony of witnesses regarding any and all accidents.

PART 2 PRODUCTS

2.01 MATERIALS

A. PPE and monitoring equipment to conform to requirements set forth by Federal and State regulations.

B. All products and materials used in connection with this Work shall remain asbestos-free.

C. Respiratory protective equipment will be NIOSH/MSHA approved.

PART 3 EXECUTION

3.01 PREPARATION OF PROJECT-SPECIFIC HASP

A. Prepare and implement a Project-Specific HASP in accordance with the requirements of OSHA 29 CFR 1910.120 (WAC 296-62-30135) and Section 4.0 of the Boeing Service Provider Manual. Submit the plan to the Project Engineer. Include, as a minimum, the following site specific information:

1. Site description and evaluation (including site layout map).
2. Names of key personnel and alternates responsible for site safety and health.
3. Site-specific safety and health hazard assessment and risk analysis based on activities and contaminants known or expected to be present (physical and chemical hazards).
4. Training.
5. PPE.
6. Medical surveillance.
7. Air monitoring.
8. Site control measures (work zones, communications and security).
9. Personnel hygiene and decontamination.
10. Equipment decontamination.

11. Logs, reports, and record keeping.

12. Heat and/or cold stress monitoring.

13. Emergency response including equipment, evacuation routes and procedures and debriefing.

14. Site specific hazard communication.

15. Hazardous material inventory and material safety data sheets (MSDS).

B. Make the Project-Specific HASP available to all employees entering the site. Require employees to read the plan, sign a compliance statement, and abide by its provisions. Display or make the plan available at the site.

C. Any review and or comments made to Contractor's Project-Specific HASP by Engineer shall be not be construed to represent approval of the Contractor's Project-Specific HASP. Review by Engineer or acceptance of the plan shall not impose any liability upon Engineer or Owner nor shall any such review or acceptance relieve Contractor of any responsibilities under the Contract.

D. Prepare an addendum for each new work activity that may be discovered during the course of the project.

3.02 SITE CONTROL MEASURES

A. Furnish and install site fencing, warning tapes, or other barricades to physically separate the contaminated work zones on the site or sites based on the Project-Specific HASP. Establish the following work zones as needed:

1. An Exclusion Zone to encompass areas designated for contaminated material storage or contaminated soil excavation. Work involving contamination will take place inside the Exclusion Zone.

2. Contamination Reduction Zone to provide a physical separation between the Exclusion and Support Zones to decontaminate personnel, equipment, and vehicles prior to entering the Support Zone from the Exclusion Zone.

3. Support Zone to provide an entry and exit for personnel, materials, and equipment to the Exclusion Zone that serves also as an area for support facilities and storage of clean work equipment. Workers may rest, eat, and drink in this area.

B. Contractor shall be responsible for costs associated with cleanup of any contamination that may be tracked outside of the Exclusion Zone.

C. Contractor shall ensure that site control measures are sufficient to prevent unauthorized entry to the site at all times during the period of performance.

3.03 LOCKOUT/TAG OUT

A. Prior to shutdown of any Boeing equipment, building system, or utility, the service provider shall notify the Boeing Onsite Activity Representative.

1. All equipment that could present a hazard from inadvertent activation during maintenance or servicing or as required elsewhere in the specifications shall have the energy supply locked out and tagged except where the energy supply is needed for troubleshooting, inspecting, or servicing equipment.

2. Before working on any energized system, you shall take the following steps in accordance with you company's procedures:

a. Isolate the energy source and release all energy or potential energy (e.g., electrical [stored], gravity, pressure, thermal, pneumatic, and hydraulic).

b. Refer to machine-specific instructions on controlling multiple energy sources.

c. Install physical lockout lock with your company lockout tag, in accordance with your company's lockout tag, tryout procedure.

3.04 TRENCH AND EXCAVATIONS

A. Pre-approval shall be obtained from the Owner's Onsite Activity Representative before excavating or opening any trench.

1. A qualified locater service shall be used to locate any utilities or other underground structures in the area where the work is to be performed.

2. Hand-digging shall be required where there is any risk of contacting underground utilities or structures

3. The service provider shall physically barricade all excavations and trenches.

4. Excavations shall be reviewed by the service provider's competent person each day and after every rainstorm or freeze/thaw situation.

5. The service provider's competent person shall assess the soil condition to determine the method of shoring or sloping required for excavation.

6. All excavations and trenches shall be shored, sloped, or otherwise protected to ensure that collapse does not occur.

3.05 PERSONAL PROTECTIVE EQUIPMENT (PPE)

A. Contractor shall provide appropriate personnel safety equipment and protective clothing and ensure that it is kept clean and well maintained. Include, as minimum levels of protection, the following:

1. Level D Protection:

a. Hard hat

b. Safety glasses

c. Work clothes

d. Steel-toed shoes

e. Hearing protection, if needed

2. Modified Level D Protection:

a. Hard hat

b. Safety glasses, face shield, goggles or other chemical-resistant eyewear as needed for applicable hazards.

c. Chemical protective, disposable overalls/coveralls

d. Inner and outer gloves (Neoprene, Nitrile, Viton or Butyl) selected based on site contaminants.

e. Chemical protective, steel toe and shank, or steel-toed safety boots with chemical-resistant, disposable boot covers.

f. Hearing protection, if needed.

3. Level C Protection:

a. All protection in modified Level D

b. Air purifying respirators with organic vapor and/or N-, or R-100 (HEPA) cartridges – NIOSH/MSHA approved, applicable to the hazard of concern

B. Contractor personnel will upgrade or downgrade PPE as directed by Engineer's CIH depending on air monitoring results and direct contact potential.

C. Decontaminate and/or properly dispose of PPE worn on site. Ensure PPE is decontaminated and inspected for integrity before being reissued. Unless agreed otherwise by Owner, used PPE and disposable equipment shall be handled in accordance with requirements for the contacted waste.

3.06 PERSONAL HYGIENE AND DECONTAMINATION

A. Define personnel decontamination protocols in the Project-Specific HASP to be followed by workers performing or supervising work within designated areas or exposed to hazardous chemical vapors, liquids or contaminated materials.

B. Perform decontamination procedures inside the Contamination-Reduction Zone.

3.07 EQUIPMENT DECONTAMINATION

A. Decontaminate vehicles and equipment used during the handling of hazardous chemicals and materials inside the Contamination Reduction Zone before leaving the Site. Collect, treat, and dipose of decontamination water using the Construction Dewatering Water Storage Treatment specified in Section 01560, CARE AND DIVERSION OF WATER.

B. Keep roads inside the Contamination-Reduction Zone free of contamination. Carefully load to avoid contamination of exterior truck surfaces.

3.08 LOGS, REPORTS AND RECORDKEEPING

A. Maintain logs and reports covering the implementation of the Project-Specific HASP including the Air Monitoring Program. Include daily logs, weekly reports, audits, and a close out report.

B. Daily Safety Logs shall include, at a minimum, the following:

1. Date

2. Name of employees working on site

3. Names of visitors to the site

4. Work activities for the day and associated health and safety issues discussed during the daily Health and Safety Briefing.

5. SSHO signature and date

C. Comply with Federal and State laws such as OSHA (29 CFR) that require the retention of training records, chemical exposure records, and medical records for a specified length of time after the termination of the job.

END OF SECTION

SECTION 01410

ENVIRONMENTAL PROTECTION

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes Environmental Protection work required to minimize environmental pollution and damage resulting from Contractor's operations during construction.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The most recent version of the publication and test method shall be applicable in all cases.

1. Owner Documents

   a. Boeing Environmental Info Sheet – Water Quality – Mobile Fueling, September 9, 2003

   b. Boeing Environmental Info Sheet – Water Quality – Small Construction Projects, December 2, 2005

   c. Boeing Service Provider Manual, January 2005

2. Washington State Department Of Ecology

   a. Construction Stormwater General Permit - National Pollutant Discharge Elimination System and State Waste Discharge Baseline General Permit for Stormwater Discharges Associated with Construction Activity, Effective Date December 16, 2005

   b. How to Meet Ecology's Construction Stormwater General Permit Requirements: A Guide for Construction Sites, Revised January 2006

1.03 GENERAL REQUIREMENTS

A. Contractor shall perform the work minimizing environmental pollution and damage as the result of construction operations, in accordance with the Construction Stormwater General Permit, the Boeing Service Provider Manual, and the Boeing Environmental Info Sheets. Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the utility of the environment for aesthetic, cultural and/or historical purposes. The control of environmental pollution and damage requires consideration of land, water, and air, and includes management of visual aesthetics, noise, solid waste, as well as other pollutants. The environmental resources within the project boundaries and those affected outside the limits of permanent work shall be protected during the entire

duration of this contract. Contractor shall ensure compliance with this section by subcontractors. Construction schedule constraints in performing various portions of the work are provided in Section 01145 SITE-SPECIFIC REQUIREMENTS.

B. Permits

1. Owner will obtain only Federal permits for this project; see contract clause PERMITS AND RESPONSIBILITIES. Contractor shall be responsible for implementing the substantive requirements of the appropriate permits as needed. Contractor shall obtain all needed certifications and licenses. State and Local permits for on-site work are not required for this project; however, Contractor must comply with substantive portions of the relevant permits. Relevant permits for this project are listed and described in the Basis of Design Report, along with the substantive requirements of each permit.

C. Notification

1. Engineer will notify Contractor in writing of any observed noncompliance with the previously mentioned Federal, State, or local laws or regulations, permits, and other elements of the environmental protection specifications. Contractor shall, after receipt of such notice, inform Engineer of proposed corrective action and take such action when approved. If Contractor fails to comply promptly, Engineer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or costs or damages allowed to Contractor for any such suspensions. Failure of Engineer to notify Contractor of noncompliance does not relieve Contractor of full responsibility of maintaining compliance conditions and work methods.

D. Previously Used Equipment

1. Contractor shall thoroughly clean all construction equipment previously used at other sites before it is brought into the work areas, ensuring that soil residuals are removed and that egg deposits from plant pests are not present; Contractor shall consult with the U.S. Department of Agriculture (USDA) jurisdictional office for additional cleaning requirements.

1.04 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

1. Filter Fabric Fence

a. Contractor shall provide Manufacturer's product data indicating the materials meet the requirements of the Drawings and specifications, within 10 calendar days after receipt of NTP.

2. Straw Bales and Mulch

a. Contractor shall provide Manufacturer's certified QA test results or certificates for samples from products a minimum of 10 calendar days prior to delivery to the site.

3. Mobile Fueling Plan

   a. Contractor shall submit a plan for safe mobile fueling of equipment within 14 calendar days of Notice to Proceed. Plan shall describe secondary containment procedures to be used during mobile fueling to protect nearby wetlands and other surface water bodies. Plan shall be consistent with the requirements of Boeing's Environmental Info Fact Sheet – Water Quality – Mobile Fueling and Boeing's Service Provider Manual.

4. Rolled Erosion Control Product (RECP)

   a. Prior to shipping material to the site, Contractor shall submit a sample of all RECP proposed for use on the project.

   b. Prior to shipping material to the site, Contractor shall submit the following information for all RECP proposed to be used on the project:

      1) Manufacturer product specifications;

      2) Manufacturer certification that the material is suitable for the design conditions nominated by this Specification;

      3) Manufacturer installation recommendations; and

      4) Contractor proposed construction methods.

   c. Submit, ten (10) working days prior to installation, name of installer, and resume of installation supervisor/field engineer to be assigned to the project.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Rolled Erosion Control Products

1. Wrap rolls in black protective wrap.

2. Attach durable label to rolls readable on inside of core and outside of roll wrapping, indicating manufacturer, product name or style number, roll number, and roll dimensions.

3. Deliver, store, and handle rolls in manner to prevent damage.

4. After unloading, inspect rolls for defects and damage.

5. Do not leave covered rolls exposed to elements for more than 30 days unless additional heavy-duty waterproof cover is provided.

6. Store rolls off ground, protected from precipitation, ultraviolet radiation, strong chemicals, sparks and flames, temperatures in excess of 160 degrees F and other environmental conditions that could cause damage.

1.06 LAND RESOURCES

A. Contractor shall confine all activities to areas defined by the Drawings and Specifications. Prior to the beginning of any construction, Contractor shall identify the land resources to be preserved within the work area. Except in areas indicated on the Drawings or specified to be cleared, Contractor shall not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, wetlands, and land forms without permission. No ropes, cables, or guys shall be fastened to or attached to any trees for anchorage unless specifically authorized. Where such emergency use is permitted, Contractor shall provide effective protection for land and vegetation resources at all times as defined in the following subparagraphs. Stone, earth, or other material displaced into uncleared areas shall be carefully removed and properly disposed of by Contractor at no additional cost to the Owner.

B. Work Area Limits

1. Prior to construction, Contractor shall mark the areas that are not to be disturbed under this contract, including wetlands, as identified on the Drawings and by Engineer during the Kickoff Meeting. Existing known wetlands include the Peat Filter System, the Created Mixed Wetland, and various streamside wetlands located downstream of the project area. Isolated areas within the general work area which are to be saved and protected shall also be marked or fenced. Monuments and markers and monitoring wells, not scheduled for abandonment on the Drawings and Specifications, shall be protected before construction operations commence. Where construction operations are to be conducted during darkness, the markers shall be visible. Contractor's personnel shall be knowledgeable of the purpose for marking and/or protecting particular objects.

C. Landscape

1. Trees, shrubs, vines, grasses, land forms, wetlands, and other landscape features indicated and defined on the Drawings to be preserved shall be clearly identified by marking, fencing, or wrapping with boards, or any other approved techniques.

D. Unprotected Erodible Soils

1. Earthwork brought to final grade shall be finished as indicated. Side slopes and back slopes shall be protected as soon as practicable upon completion of rough grading. All earthwork shall be planned and conducted to minimize the duration of exposure of unprotected soils. Clearing of such areas shall progress in reasonably sized increments as needed to use the developed areas as approved by Engineer.

E. Disturbed Areas

1. Contractor shall effectively prevent erosion and control sedimentation through approved methods including, but not limited to, the following:

a. Retardation of runoff and prevention of runoff channelization. Runoff from the construction site or from storms shall be retarded by means of site perimeter silt fencing, straw bales, and the preservation of a vegetated buffer area around the

site, and by any measures required by area-wide plans under the Clean Water Act. Straw mulch shall also be employed for temporary soil stabilization if an area is to remain unworked for longer than 1-week.

b. Erosion and sedimentation control devices. Contractor shall install temporary and permanent erosion and sedimentation control features as indicated on the Drawings. Filter fabric fencing, decant weir, straw bales, and mulches shall be maintained until permanent drainage and erosion control facilities are completed and operative.

c. Stabilized construction entrance. Contractor shall construct and maintain a stabilized construction entrance at the location shown on the Drawings, where construction equipment travel transitions from unpaved to paved surfaces. Stabilized construction entrance shall be constructed as described in Paragraph 3.04 STABILIZED CONSTRUCTION ENTRANCE.

d. Cleanup of roadways. Contractor shall maintain roads and parking areas traveled by construction equipment free of debris, tracked mud, and spillage. Cleanup of roadways shall be performed daily at a minimum. Any damage to public roadways caused by Contractor's equipment shall be restored at Contractor's expense.

F. Contractor Facilities and Work Areas

1. Contractor's field offices, staging areas, stockpile storage, and temporary buildings shall be placed in areas designated on the Drawings or as directed by Owner. Temporary movement or relocation of Contractors facilities shall be made only when approved by Owner. Borrow areas, if required, shall be managed to minimize erosion and to prevent sediment from entering nearby waters. Spoil areas shall be managed and controlled to limit spoil intrusion into areas designated on the Drawings and to prevent erosion of soil or sediment from entering nearby waters. Spoil areas shall only be developed with written approval of Engineer. Temporary excavation and embankments for plant and/or work areas shall be controlled to protect adjacent areas from despoilment.

1.07 WATER RESOURCES

A. Contractor shall keep construction activities under surveillance, management, and control to avoid pollution of surface and ground waters. Toxic or hazardous chemicals shall not be applied to soil or vegetation when such application may cause contamination of the fresh water reserve. Monitoring of water areas affected by construction shall be Contractor's responsibility. All water areas affected by construction activities shall be monitored by Contractor.

B. Mobile Equipment Fueling

1. No mobile equipment fueling shall take place within the bed of Powder Mill Creek without written approval of Engineer. Contractor shall avoid, to the extent possible, equipment fueling adjacent to the creek, peat filter, and wetland. When equipment

fueling must be performed near these features, it shall be conducted using secondary containment to capture potential fuel spills.

C. Washing Water

1. Contractor shall ensure that water used to dislodge sediment from voids or wash sediment adhering to riprap boulders is collected and treated as specified in Section 02111 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL.

D. Diversion Operations

1. Construction operations for dewatering shall be controlled at all times to limit the impact of water turbidity and contaminants known to be present at the site on the habitat for wildlife and on water quality for discharge and downstream use.

2. Contractor shall construct and maintain a decant weir located at the downstream extent of the work area, as shown on the Drawings. The decant weir shall remain in place until the first flush of storm water through the project reach is observed by Owner following acceptance of construction complete, and for a minimum of 24 hours thereafter. Contractor shall return to the work site to remove the decant weir after the first flush.

3. Potentially-contaminated construction dewatering water from the excavation activities shall be collected and treated in a temporary Construction Dewatering Water Storage, Treatment, and Discharge System described in Section 01560 CARE AND DIVERSION OF WATER.

E. Fish and Wildlife

1. Contractor shall minimize interference with, disturbance to, and damage of fish and wildlife. No fish are present in the project reach of Powder Mill Creek.

1.08 AIR RESOURCES

A. Equipment operation and activities or processes performed by Contractor in accomplishing the specified construction shall be in accordance with the State's air quality rules and all Federal emission and performance laws and standards. Ambient air quality standards set by the Environmental Protection Agency shall be maintained. Monitoring of air quality shall be Contractor's responsibility. All air areas affected by the construction activities shall be monitored by Contractor.

B. Particulates

1. Dust particles; aerosols and gaseous by-products from construction activities; and processing and preparation of materials shall be controlled at all times, including weekends, holidays, and hours when work is not in progress. Contractor shall maintain excavations, stockpiles, haul roads, permanent and temporary access roads, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from airborne particulates which would cause the air pollution standards to be exceeded or which would cause a hazard or a nuisance. Sprinkling, chemical treatment of an

approved type or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp at all times. Contractor must have sufficient, competent equipment available to accomplish these tasks. Particulate control shall be performed as the work proceeds and whenever a particulate nuisance or hazard occurs.

C. Hydrocarbons and Carbon Monoxide

1. Hydrocarbons and carbon monoxide emissions from equipment shall be controlled to Federal and State allowable limits at all times.

D. Sound Intrusions

1. Contractor shall keep construction activities under surveillance and control to minimize environment damage by noise, in accordance will all applicable Federal, State, and local regulations.

1.09 WASTE DISPOSAL

A. Solid Wastes

1. Solid wastes, excluding contaminated material specified to be contained in roll-off units in accordance with Section 02111 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL, shall be placed in containers that are emptied on a regular schedule. Handling and disposal shall be conducted to prevent contamination. Segregation measures shall be employed so that no hazardous or toxic waste shall become co-mingled with solid waste. Contractor shall transport solid waste, including clearing debris, off Owner-controlled property and dispose of it in compliance with Federal, State, and local requirements for solid waste disposal.

B. Hazardous Materials Used by Contractor

1. Contractor shall take sufficient measures to prevent spillage of any materials of construction containing hazardous and toxic materials during operations (i.e. hydraulic fluid, ethylene glycol, etc.) and shall collect any such spilled materials in suitable containers, observing compatibility. Contractor shall inform Engineer and Owner of any hazardous waste generated during construction and request direction from Owner regarding proper transport and disposal. Spills of hazardous or toxic materials shall be immediately reported to Owner and Engineer. Cleanup and cleanup costs due to spills shall be Contractor's responsibility.

C. Burning

1. Burning will not be permitted.

1.10 HISTORICAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

A. No historical, archaeological, and cultural resources within Contractor's work area have been identified. If identified during the course of the work, Contractor shall take precautions to preserve all such resources as they existed at the time they were first pointed out.

Contractor shall provide and install protection for these resources and be responsible for their preservation during the life of the contract. If during excavation or other construction activities any previously unidentified or unanticipated resources are discovered or found, all activities that may damage or alter such resources shall be temporarily suspended. Resources covered by this paragraph include but are not limited to: any human skeletal remains or burials; artifacts; shell, midden, bone, charcoal, or other deposits; rocks or coral alignments, pavings, wall, or other constructed features; and any indication of agricultural or other human activities. Upon such discovery or find, Contractor shall immediately notify Engineer. While waiting for instructions Contractor shall record, report, and preserve the finds in accordance with the National Historic Preservation Act and 43 Code of Federal Regulations Subtitle A Part 7, Protection of Archeological Resources.

1.11 POST-CONSTRUCTION CLEANUP

A. Contractor shall clean up all areas used for construction.

1.12 RESTORATION OF LANDSCAPE DAMAGE

A. Contractor shall restore landscape features damaged or destroyed during construction operations outside the limits of the approved work areas.

1.13 MAINTENANCE OF POLLUTION FACILITIES

A. Contractor shall maintain permanent and temporary pollution control facilities and devices for the duration of the contract or for that length of time construction activities create the particular pollutant.

1.14 TRAINING OF CONTRACTOR PERSONNEL

A. Contractor shall advise his personnel regarding all pertinent phases of environmental protection required in the Contract Documents. The training shall include methods of detecting and avoiding pollution, proper fueling techniques at this site, familiarization with pollution standards, both statutory and contractual, and installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental pollution control.

PART 2 PRODUCTS

2.01 FILTER FABRIC FENCE

A. Geotextile

1. Manufacturer's fabric specifications must be submitted for approval and must be available on-site.

2. Geotextile shall be a woven monofilament or non-woven fabric. Slit-film fabric shall not be used.

3. Apparent opening size (AOS), American Society for Testing and Materials [ASTM] D-4751): 100

4. Water permitivity (ASTM D-4491): 0.02 sec-1 minimum

5. Grab tensile strength (ASTM D-4632): 100 pounds minimum

6. Grab tensile elongation (ASTM D-4632): 30 percent maximum

7. Ultraviolet resistance (ASTM D-4355): 70 percent minimum

B. Posts: 2- by 4-inch wood or steel fence posts

C. Wire Mesh Backing: 14 gauge with 2-inch by 2-inch square openings

2.02 SAND BAGS

A. Sand bags shall be burlap or polypropylene and filled to a minimum weight of 30 pounds.

2.03 STRAW BALES AND MULCH

A. Straw bales and mulch shall be air-dried, well-seasoned, and free of undesirable seeds, noxious weeds, and all other material detrimental to plant life.

2.04 ROLLED EROSION CONTROL PRODUCTS

A. Rolled Erosion Control Product shall be S150BN, manufactured by North American Green, Evansville, IN; or approved alternate.

B. Accessories:

1. Ground Anchoring Devices shall be comprised of U-shaped wire staples, Minimum 8 gauge; Length: 6-inches or sufficient ground penetration to resist pullout. Longer anchors may be required in looser soils.

2. Ground Anchoring Devices shall not penetrate within 12-inches of any subsurface features. Any damage to subsurface features caused by ground anchoring devices shall be repaired at the sole expense of the Contractor.

PART 3 EXECUTION

3.01 PERIMETER FILTER FABRIC FENCES

A. Construction

1. Install prior to other land-disturbing activities

2. Silt fence trench: 8 inches wide by 12 inches deep; backfill trench with compacted native soil

3. Fence posts: Maximum separation, 6 feet

4. Posts: Drive 30 inches into ground

5. Fabric: Staple to posts per manufacturer's recommendations

6. Fence: Wire mesh backing

7. Alignment: Follow contours, within a tolerance of 1 vertical foot

8. Fence ends: extend upslope perpendicular to the contour for a distance of at least 6-feet to inhibit flow around the end of the fence

9. Fence sections: Overlap at least 10 feet

B. Maintenance

1. Inspection: Daily. Repair damage immediately.

2. Sediment removal: If sediment is evident, remove the trapped sediment. Remove accumulated sediment at least daily.

3. Photo-degraded or damaged fabric: Replace

4. Final site stabilization: Remove fence

3.02 DECANT WEIR

A. Construction

1. Install prior to other land-disturbing activities in the creek bed, at the downstream end of the work area, immediately downstream of the dewatering sump

2. Surface preparation: Along Decant Weir alignment, set aside branches, large cobbles, and other native debris. Hand-grade weir location to produce a relatively uniform surface.

3. Key trench: Along central axis of weir alignment (across creek from bank to bank), excavate a key trench 6 inches deep and approximately 1 foot wide (one sandbag width).

4. Sand bag placement: Place sand bags in key trench and directly on native surface

5. Alignment: Follow contours, across entire width of creek bed

6. Weir height: Nominally 3 feet from creek bed except at flow notch and a creek banks (see drawings)

7. Flow notch: Over a 4-foot length at the center of the weir, height shall be nominally 18 inches to confine flow to this location

B. Maintenance

1. Inspection: Daily. Repair damage immediately.

2. Sediment removal: If sediment is evident, remove the trapped sediment. Remove accumulated sediment at least daily.

3. Final site stabilization: Remove Decant Weir 24 hours after first flush storm event following final construction acceptance

3.03 STRAW MULCH

A. Application

1. Disturbed areas that will remain unworked for longer than one week

2. Rate: 3 tons per acre (3 bales per 1,000 square foot, or 3 inches thick)

3. Secure mulch to soil: "Crimp" straw into soil by operating tracked vehicle (or straw crimping equipment) parallel to slope (up and down slope)

B. Maintenance

1. Stockpiled straw: have available on-site sufficient straw to replace 10 percent of covered area

2. Inspect straw mulch: After each rainfall event, repair by replacing straw and re-crimping

3.04 ROLLED EROSION CONTROL PRODUCT (RECP)

A. Definitions

1. Installer: Contractor (or a subcontractor to the Contractor) shall act as the installer, i.e., the party responsible for field handling, transporting, storing, deploying, seaming, temporary restraining (against wind), and installation of the Rolled Erosion Control Product (RECP). The installer may also be referred to as the RECP subcontractor.

2. Manufacturer: The party also referred to as the RECP manufacturer or fabricator, responsible for the production of the RECP in accordance with this Specification.

B. Preparation

1. Grade and compact areas to be treated with RECP to the lines and levels indicated on the Drawings. The surface shall be prepared as per Section 02940 STREAM RESTORATION, Section 01500 TEMPORARY CONSTRUCTION FACILITIES, and the following requirements.

a. Remove rocks, soil clods, and vegetation that could prevent the RECP from being in intimate contact with the subgrade. The surface to receive RECP shall be smooth with no ruts or ridges greater than 1 inch.

b. Prepare seedbed by loosening the top 2 to 3 inches of soil.

c. Excavate 6 inches wide by 12 inches deep anchor trench at upgrade end of installation to inhibit undermining from stray surface water.

C. Installation

1. RECP shall be installed at the locations shown on the Drawings and as approved by Engineer.

2. Immediately following establishment of the final grade, RECP shall be unrolled parallel to the flow of water.

3. Where more than 1 strip of the RECP is required to cover the given area, it shall overlap the adjacent strip a minimum of 6 inches.

4. The ends of the RECP shall overlap at least 6 inches with the upgradient section on top.

5. The RECP shall be secured in accordance with the manufacturer's directions and the following:

   a. The up-slope end of each RECP shall be staked and buried in a 12 inch deep trench with the soil firmly tamped against the mat.

   b. Three ground anchors per width of matting (one [1] ground anchor at each overlap) shall be driven below the finish ground line prior to backfilling of the trench.

   c. Engineer may require that any other edge exposed to more than normal flow of water or strong prevailing winds be anchored and buried in a similar manner.

6. The edges of RECP shall be buried around the edges of catch basins and other structures. RECP must be spread evenly and smoothly and in contact with the soil at all points.

7. RECP shall be held in place by approved ground anchors driven vertically into the soil. RECP shall be anchored in accordance with the manufacturer's recommendations for channel applications and the following:

   a. RECP shall be anchored at intervals not more than 3 feet apart in 3 rows for each strip of the matting, with 1 row along each edge and 1 row alternately spaced in the middle.

   b. Anchoring devices and frequency shall be sufficient to securely anchor the RECP flush against the finished grade.

8. Seeding shall occur after the placement of the RECP. Seed shall be placed in accordance with Section 02921 SEEDING.

9. Contractor shall be responsible to immediately repair all damaged areas. Cost for repair and maintenance shall be included in the unit contract price of the RECP.

D. Acceptance

1. Contractor retains all ownership and responsibility for RECP until written acceptance by Engineer.

2. Engineer will accept the RECP when:

a. The installation is complete;

b. Conformance test results verify that the product requirements of this Specification have been achieved;

c. Documentation is complete;

d. Verification of the adequacy of all anchoring is complete; and

e. The required written certification documents have been received by Engineer.

3.05 STABILIZED CONSTRUCTION ENTRANCE

A. Stabilized aggregate base course aggregate, as specified in Section 1500 TEMPORARY CONSTRUCTION FACILITIES, shall be placed in one or two successive horizontal layers and compacted to form the stabilized construction entrance at the location and with the dimensions indicated on the Drawings. The depth shall be 8 inches minimum.

END OF SECTION

SECTION 01500

TEMPORARY CONSTRUCTION FACILITIES

PART 1 GENERAL

1.01 GENERAL REQUIREMENTS

A. Identification of Employees

1. Contractor shall be responsible for obtaining identification badges from Owner for each employee, and for requiring each employee engaged on the work to display the identification badge while on Owner's property. Requirements for identification badging are specified in Section 01145 SITE-SPECIFIC REQUIREMENTS. Owner-supplied identification shall immediately be returned to Owner for cancellation upon release of any employee. Delivery drivers and other personnel typically on site for less than one full day (in aggregate) during the course of the Work are exempt from this requirement, provided that such personnel are accompanied by badged Contractor personnel at all times while on Owner's property. Contractor and subcontractor personnel shall wear identifying markings on hard hats clearly identifying the company for whom the employee works.

B. Employee Parking

1. Contractor employees shall park privately owned vehicles in an area designated by Owner. This area shall be within reasonable walking distance of the construction site. Contractor employee parking shall not interfere with existing and established parking requirements of the facility.

1.02 SUBMITTALS

A. None.

1.03 AVAILABILITY AND USE OF UTILITY SERVICES

A. Temporary Water and Electricity

1. Contractor shall provide temporary water and electricity required for construction. Materials may be new or used and shall be adequate for the required usage, shall not create unsafe conditions, and shall not violate applicable codes and standards. No electrical power is available on site. Contractor shall provide fuel-powered equipment or electrical generators, as necessary. Water is available from Owner at building 40-09, located less than ½ mile west of the access road turnoff to Powder Mill Gulch from North Perimeter Road. Water is available from an exterior building spigot. Contactor shall arrange water access with Owner at the kickoff meeting.

B. Sanitation

1. Contractor shall provide and maintain within the construction area field-type sanitary facilities. The number of sanitary facilities shall be matched to the maximum number of personnel working at the site as required by Federal, State, and local codes and regulations. Sanitary facilities shall be equipped with a hand-washing station. Owner toilet facilities will not be available to Contractor's personnel.

1.04 PROTECTION AND MAINTENANCE OF TRAFFIC

A. Contractor shall maintain and protect traffic and parked vehicles on all affected roads and parking lots during the construction period except as otherwise specifically directed by Owner. Measures for notification, any required hauling permits, the protection and diversion of traffic, including the provision of watchmen and flagmen, erection of barricades, placing of lights around and in front of equipment and the work, and the erection and maintenance of adequate warning, danger, and direction signs, shall be as required by the state and local authorities having jurisdiction. The traveling public and Owner personnel shall be protected from damage to person and property. Contractor's traffic on roads selected for hauling material to and from the Site shall interfere as little as possible with public traffic. Contractor shall investigate the adequacy of existing roads and parking lots and the allowable load limit on these roads and parking lots. Contractor shall be responsible for the repair of any damage to roads and parking lots caused by construction operations.

B. Haul Roads

1. Contractor shall restrict equipment operating outside the work area to designated haul roads and routes shown in the Drawings or otherwise approved by Owner. Contractor shall provide necessary lighting, signs, barricades, and distinctive markings for the safe movement of traffic. Suitable methods of dust control shall be used and shall be adequate to ensure safe operation at all times. Location, grade, width, and alignment of new construction access roads shall be subject to approval by Owner. Upon completion of the work, haul and access roads shall be removed unless otherwise designated to remain for permanent access on the Drawings.

C. Barricades

1. Contractor shall erect and maintain temporary barricades to limit public access to hazardous areas. Such barricades shall be required whenever safe public access to paved areas such as roads, parking areas or sidewalks is prevented by construction activities or as otherwise necessary to ensure the safety of both pedestrian and vehicular traffic. Barricades shall be securely placed, clearly visible, and with adequate illumination to provide sufficient visual warning of the hazard during both day and night.

1.05 CONTRACTOR'S TEMPORARY FACILITIES

A. Administrative Field Offices

1. Contractor shall provide and maintain administrative field office facilities within the construction area, if required by Contractor. Owner office and warehouse facilities will not be available to Contractor's personnel.

B. Creek Access Road

1. Contractor shall construct an access road to the project reach of Powder Mill Creek in the general location shown on the Drawings. Contractor shall field locate the access road and shall begin construction only after approval of the location and alignment by Engineer. Contractor is advised that the completed access road will have grades up to 35 percent. The Creek Access Road shall have the following characteristics:

   a. Alignment shall be cleared and grubbed within the limits shown on the Drawings. Clear and grub only the area required to complete the access road construction. Unsuitable surface soils shall be removed and disposed of by Contractor.

   b. The width of the access road shall be a minimum of 10 feet. The access road may be widened to accommodate construction equipment upon written approval of Engineer.

   c. Alignment shall be graded to achieve a minimum 2 percent slope toward a rock-lined stormwater channel on the north/west side of the access road as shown on the Drawings.

   d. In areas where road alignment is underlain by riprap, Contractor shall temporarily remove and then reset riprap as needed to maintain slope stability.

   e. Access road shall be surfaced with stabilized base course aggregate to a minimum thickness of 1 foot.

   f. Contractor shall construct a rock-lined stormwater channel on the north/west side of the access road as shown on the Drawings. Channel shall be a minimum of 18 inches deep and 36 inches wide, and surfaced with stabilized base course aggregate to a minimum thickness of 1 foot.

   g. All stormwater flow from the existing channel west of the Creek Access Road location shall be routed to the new rock-lined stormwater channel.

2. The Creek Access Road shall remain at the completion of construction. Portions of the road that interfere with discharge at the sediment basin outlet works shall be pulled back or otherwise shaped to allow unrestricted flow from the outlet works. Contractor shall restore cleared areas surrounding the Creek Access Road as specified in Section 02930 EXTERIOR PLANTING.

C. Creek-Side Laydown Area

1. Owner shall make available to Contractor the Creek-Side Laydown Area as shown on the Drawings. Contractor shall use this area as the primary access point to the creek bed, as a storage and work area, as a personnel and equipment decontamination area and as a roll-off unit loading point for contaminated material removed from the creek. Contractor shall provide environmental protection at the perimeter of the Creek-Side Laydown Area as shown on the Drawings and as specified in Section 01410 ENVIRONMENTAL PROTECTION.

D. Supplemental Laydown Areas

1. Owner shall make available to the Contractor Supplemental Laydown Areas as shown the Drawings. Contractor may use these areas for staging equipment, supplies, vehicles, or water treatment equipment as needed. Contaminated material shall not be staged or stored in Supplemental Laydown Areas. Contractor shall provide environmental protection at the perimeter of the Supplemental Laydown Areas as shown on the Drawings and as specified in Section 01410 ENVIRONMENTAL PROTECTION.

E. Excavated Material Temporary Storage Area.

1. The Excavated Material Temporary Storage Area shall be used for storage of roll-off units containing excavated sediment until Owner disposes of liquid and solids in the roll-off units (within 90 days of generation). Contractor shall construct secondary containment in the Excavated Material Temporary Storage Area as shown on the Drawings. Volume of the secondary containment shall be a minimum of 10 percent of the sum of the volumes of all containers to be stored. The secondary containment area shall also be large enough to allow transfer of excavated sediment from vacuum truck equipment (if used) to roll-off units within the area of secondary containment. Contractor shall provide and install temporary fencing to completely enclose the excavated material temporary storage area. Contractor will be responsible for demolition of the secondary containment 90 days from the time of placement of the first roll-off unit. Contractor shall restore the Excavated Material Temporary Storage Area to pre-construction conditions, or better. The secondary containment system in the Excavated Material Temporary Storage Area shall have the following characteristics:

a. Minimum of 1-inch of asphalt pavement or a chemically resistant geomembrane liner. Existing asphalt pavement is suitable for secondary containment provided all existing cracks are sealed with CSS-1 emulsified asphalt or rubberized asphalt in accordance with WSDOT (2002 Edition), Section 5-04.3(5)C Crack Sealing. Non-reinforced geomembrane liners shall have a minimum thickness of 20 mils. Scrim reinforced geomembrane liners shall have a minimum weight of 40 pounds per 1,000 square feet. The ground surface on which the geomembrane is to be placed shall be free of rocks greater than 0.5 inch in diameter and any other object that could damage the membrane.

b. Contractor shall perform operations within the secondary containment area in a manner that protects the containment liner from puncture. Planks or suitable supported metal grating shall be placed on top of a geomembrane liner, if used in lieu of asphalt, to allow vehicle and roll-off unit access while protecting the liner.

c. Berms surrounding the entire Excavated Material Temporary Storage Area shall be a minimum of 12 inches in height. Vehicle access points shall also be bermed. Berms may be constructed of soil or asphalt.

d. Liquid that accumulates in the Temporary Storage Area (outside the roll-off containers) during the construction period shall be collected and transferred by Contractor to the Construction Dewatering Water Storage, Treatment, and

Discharge System described in Section 01560 CARE AND DIVERSION OF WATER. From the date of acceptance of the completed construction by Owner, until Contractor returns to demolish the secondary containment system, Owner will collect, treat and dispose of liquid that accumulates in the Area using existing treatment facilities.

F. Appearance of Trailers

1. Trailers utilized by Contractor for administrative or material storage purposes shall present a clean and neat exterior appearance and shall be in a state of good repair.

G. Security Provisions

1. Adequate outside security lighting shall be provided at Contractor's temporary facilities. Contractor shall be responsible for the security of its own equipment; in addition, Contractor shall notify Owner security office requesting periodic security checks of the temporary facilities.

PART 2 PRODUCTS

2.01 STABILIZED BASE COURSE AGGREGATE

A. Stabilized base course aggregate shall be used for construction of the Creek Access Road and rock-lined stormwater channel. It shall consist of the material specified below.

B. Aggregates

1. Aggregates shall consist of crushed stone, crushed gravel aggregate, angular sand, or other approved materials. Aggregates shall be durable and sound, free from lumps of clay, organic matter, objectionable coatings, and other foreign material. Material retained on a No. 4 sieve shall be known as coarse aggregate and that passing the No. 4 sieve shall be known as binder material.

2. Coarse Aggregate

a. Coarse aggregates, consisting of angular fragments of uniform density and quality, shall have a percentage of wear not to exceed 40 percent after 500 revolutions when tested in accordance with ASTM C 131. The coarse aggregate shall not have a loss greater than 15 percent weighted average at five cycles when tested for soundness in magnesium sulfate in accordance with ASTM C 88. The amount of flat and elongated particles shall not exceed 30 percent. A flat particle is one having a ratio of width to thickness greater than 3, and an elongated particle is one having a ratio of length to width greater than 3.

1) Crushed Gravel Aggregate: Crushed gravel aggregate shall be manufactured from gravel particles 50 percent of which by weight are retained on the maximum size gradation sieve specified prior to crushing.

2) Crushed Stone: Crushed stone retained on each sieve specified shall contain at least 50 percent by weight of crushed pieces having two or more freshly

fractured faces with the area of each face being at least equal to 75 percent of the smallest midsection area of the piece. When two fractures are adjacent, the angle between the planes of the fractures must be at least 30 degrees to count as two fractured faces.

3. Binder Material

   a. Binder material shall consist of screenings, angular sand, or other finely divided mineral matter processed or naturally combined with the coarse aggregate. Liquid-limit and plasticity-index requirements shall apply to any component that is blended to meet the required gradation and shall also apply to the completed course. The portion of any component or of the completed course passing the No. 40 sieve shall be either non-plastic or have a liquid limit not greater than 25 and a plasticity index not greater than 5.

4. Gradation

   a. The stabilized base course aggregate shall be equivalent to the requirements described in WDOT Standard Specifications Section 9-03.9(1) or equivalent. The aggregates shall be continuously graded in accordance with Table 01500-1 STABILIZED BASE COURSE AGGREGATE GRADATION.

Table 01500-4
STABILIZED BASE COURSE AGGREGATE GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
2.5-inch	100
2-inch	65-100
1-inch	50-85
No. 4	30-50
No. 40	16 Max
No. 200	9 Max

NOTE: The values are based on aggregates of uniform specific gravity, and the percentages passing the various sieves are subject to appropriate correction in accordance with ASTM C 127 and ASTM C 128 when aggregates of varying specific gravities are used.

PART 3 EXECUTION

3.01 CLEANUP

A. Construction debris, waste materials, packaging material and trash shall be removed from the work site daily. Any dirt or mud which is tracked onto paved or surfaced roadways shall be cleaned away. Stored material not in trailers shall be neatly stacked when stored.

3.02 RESTORATION OF STORAGE AREAS

A. Upon completion of the project and after removal of trailers, materials, sanitation facilities, and equipment from the site, areas used by Contractor for the storage of equipment or material, or other use, shall be restored to the original or better condition.

END OF SECTION

SECTION 01560

CARE AND DIVERSION OF WATER

PART 1 GENERAL

1.01 DESRIPTION

A. This section describes the dewatering, treatment, discharge, and/or diversion of any water that might be required for performance of contract work. The work includes care and any necessary diversion of water in the vicinity of contaminated material work areas, seepage into excavations, and water potentially generated by Contractor's sediment removal methods.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

1. Construction Dewatering Water Storage, Treatment, and Discharge System

a. Contractor shall submit shop drawings showing design details and layout for the Construction Dewatering Water Storage, Treatment, and Discharge System, and procedures for operation. These shop drawings shall be submitted within 10 calendar days following Notice to Proceed.

2. Storm Contingency Plan

a. Contractor shall submit, within 15 calendar days of Notice to Proceed, a Storm Contingency Plan. The Storm Contingency Plan shall detail actions to be taken in the event of an unexpected storm that could cause stormwater to enter the work area. The Storm Contingency Plan shall incorporate the information and procedures included in Section 01145 SITE-SPECIFIC REQUIREMENTS, Paragraph 1.05.

1.03 STREAM AND GROUNDWATER CONDITIONS

A. Excavation activity will occur in the bed of an active creek channel at the head of the creek. The creek originates at the outflow from the Stormwater Detention Basin, which is part of the Boeing stormwater retention and treatment facilities in Powder Mill Gulch. The operation of these facilities is described in the Basis of Design Report. Contractor personnel working in the creek shall be familiar with the operation of the Stormwater Detention Basin as described in the Basis of Design Report. Contractor shall be prepared with contingency plans to protect workers and secure the work area in the event of rain events that could cause discharge from the Stormwater Detention Basin in accordance with Section 01410, ENVIRONMENTAL PROTECTION.

B. No base groundwater flow is expected in the project reach of Powder Mill Creek if the work is conducted between August 1 and September 30. This reach of creek does not typically

receive base flow from groundwater recharge, instead only receiving flow from the Stormwater Detention Basin discharge pipe, leakage from the Stormwater Detention Basin, and culvert and overland flow in the case of storm events. With the Stormwater Detention Basin empty, and in the absence of unexpected storm events, only minimal water flow is expected in the project reach during construction.

C. Project area groundwater conditions are described in the Basis of Design Report. Groundwater is expected to be present at 0 to 6 feet below the creek bed during the period August 1 through September 30. Groundwater elevation data indicate that groundwater may enter the work area over a portion of the project reach as sediment is excavated, even to shallow excavation depths. Seepage from wet creek bed sediments is also expected to accumulate in the excavation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 DEWATERING

A. Sources of Water

1. Dewatering of the following water sources may be required: seepage from material being excavated; water derived from the use of any processes (such as pressure washing) to facilitate removal of sediment from loose riprap and voids between riprap; water from precipitation that falls on the work area and adjacent drainage surfaces during construction; water that enters the excavation from the Stormwater Detention Basin during an unexpected storm event; and shallow groundwater. The Construction Dewatering Water Storage, Treatment, and Discharge System described in paragraph 3.01C Construction Dewatering Water Storage, Treatment, and Discharge System will be used to process all of these water sources except water from an unexpected storm event. Water from an unexpected storm event will pass through the construction area in accordance with the requirements of Section 01410 ENVIRONMENTAL PROTECTION and Contractor's Storm Contingency Plan.

B. Fish Passage

1. Fish do not utilize the project reach of Powder Mill Creek, as documented in the Basis of Design Report. No provisions for fish passage are required.

C. Construction Dewatering Water Storage, Treatment, and Discharge System

1. Contractor shall provide sufficient water treatment and storage capacity in a temporary Construction Dewatering Water Storage, Treatment, and Discharge System to complete the excavation in the dry. At a minimum, Contractor shall provide a temporary Construction Dewatering Water Storage, Treatment, and Discharge System that includes raw water equalization weir tank(s) (20,000 gallon minimum capacity), treated water batch tank(s) (60,000 gallon minimum capacity), and particulate filtration including bag and media filters in series with a treatment capacity of 50 gpm. Contractor shall also provide pumps and conveyance hose or piping capable of handling up to 50 gpm. Treatment is not expected to be necessary for removal of

contaminants other than free PCB particulates and PCBs sorbed to sediment particles. However, Contactor shall stage on site carbon filtration to allow additional treatment of water if required based on initial testing. Contractor shall also stage on site in-line mixing equipment and flocculent to be added to the influent water stream if bag and media filtration is found to be insufficient for particulate removal. Unused equipment and materials shall be returned to the vendor at the completion of work and credited on the final invoice. Expected contaminant concentrations in collected water are provided in Table 01560-1 and are below discharge criteria for the Everett POTW.

2. The system shall be operated in batch mode. A storage capacity of at least 20,000 gallons shall be provided in the raw water equalization and weir tank(s). Following overnight settling of water in this tank, the water shall be pumped to the particulate filters. Treated water shall be accumulated in the treated water batch tank(s). The treated water batch tank(s) will be sampled periodically by Engineer, who will approve batch discharges to the Everett POTW manhole based on the sample results. Discharges shall be performed by Contractor to the manhole indicated on the Drawings.

3. In the event of a batch failing the discharge criteria, Contractor shall be prepared to mobilize additional tankage as needed to allow reprocessing of water while continuing dewatering.

3.02 DIVERSION OF CREEK WATER

A. As described in paragraph 1.03 STREAM AND GROUNDWATER CONDITIONS, the project reach of Powder Mill Creek is not expected to be flowing at the time of construction. As described in paragraph 3.01A Sources of Water, all water (except that from an unexpected storm event) in the project reach shall be collected by Contractor during construction and treated using the Construction Dewatering Water Storage, Treatment, and Discharge System. All water shall be collected immediately upstream of the decant weir required under Section 01410 ENVIRONMENTAL PROTECTION. All water shall be diverted from the work area by Contractor and not allowed to flow past the weir into downstream reaches, except for water from an unexpected storm event as described in Section 01410 ENVIRONMENTAL PROTECTION.

Table 01560-1
Construction Dewatering Water Influent Concentrations and Treatment Goals

Constituent	Expected Maximum Influent Concentration	Treatment Goal	Basis for Treatment Goal	Treatment Expected to be Necessary?
Arsenic	NA	0.5 mg/L	Everett POTW limit	No
Cadmium	NA	0.24 mg/L	Everett POTW limit	No
Chromium	<0.005 mg/L	5.0 mg/L	Everett POTW limit	No
Copper	0.006 mg/L	3.0 mg/L	Everett POTW limit	No
Lead	0.001 mg/L	1.89 mg/L	Everett POTW limit	No
Mercury	NA	0.1 mg/L	Everett POTW limit	No
Nickel	NA	2.83 mg/L	Everett POTW limit	No
Silver	NA	0.49 mg/L	Everett POTW limit	No
Zinc	0.082 mg/L	4.0 mg/L	Everett POTW limit	No
pH	6 to 8 SU	5.0 to 10.0 SU	Everett POTW limit	No
Closed Cup Flashpoint	Greater than 140 degrees F	Minimum 140 degrees F	Everett POTW limit	No
TCE	0.0058 mg/L	Non-interference	Everett POTW limit	No
PCBs	<0.000017 mg/L	0.003 mg/L	TSCA	No
PAHs	<0.000010 mg/L	Non-interference	Everett POTW limit	No

Although historic data are not available for some metals in water for which the Everett POTW has an established discharge limit, there is no known source for these metals at the Boeing Everett Facility. Metals for which data are available are found at concentrations several orders of magnitude below the discharge limits. Construction dewatering water will be filtered to reduce the total suspended solids and sampled for the complete list of metals (and other potential contaminants) in this table prior to discharge.

Notes:
F – Fahrenheit
PCBs – polychlorinated biphenyls
PAHs – polynuclear aromatic hydrocarbons
mg/L – micrograms per liter
NA – historic samples were not analyzed for this metal because there is no known source of this metal at the facility
POTW – publicly-owned treatment works
SU – standard units
TCE – trichloroethene
TSCA – toxic substances control act limit for sanitary sewer discharge
< - less than

END OF SECTION

SECTION 01720

FIELD ENGINEERING

PART 1 GENERAL

1.01 DESCRIPTION

A. Contractor shall provide all materials, items, operations, or methods specified, listed, or scheduled on the Drawings or in the Specifications, including all materials, labor, equipment, and incidentals necessary and required to conduct proper surveys required to stake and layout the work.

B. Contractor shall perform surveys for layout of the work and to document final construction for "record" drawings.

1.02 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

1. Survey Data for Record Drawings

a. Prior to submitting a final invoice, Contractor shall furnish Engineer electronic survey data documenting the completed construction.

1.03 QUALITY CONTROL

A. All survey, layout, and related work shall be performed and signed by a qualified land surveyor registered in the State of Washington.

1.04 PROJECT RECORD DOCUMENTS

A. Upon completion of the work, Contractor shall submit Field Record Documents to Engineer under the provisions of Section 01780 RECORD DRAWINGS.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Contractor shall exercise care during the execution of the work to minimize any disturbance to existing property and to the landscape in the areas surrounding the work site. Contractor shall minimize work conducted in areas identified on the Drawings as wetlands, and shall only enter wetland areas when necessary, ensuring minimal disturbance of the wetland areas.

3.02 INSPECTION

A. Contractor shall verify locations of existing site reference and survey control points prior to starting work. Contractor shall promptly notify Engineer of any discrepancies discovered. Contractor shall also verify layouts periodically during construction.

3.03 SURVEY REFERENCE POINTS

A. Survey reference points have been established by prior contract at the site. Contractor shall locate and verify the accuracy of these reference points for coordinate location and elevations prior to using them for work performed at the site. If any discrepancies exist in the location of the existing benchmarks, Contractor shall notify Engineer prior to performing any site layout activities. Contractor may install additional reference points for his convenience at locations approved by Engineer. No payment will be made for any additional permanent site control installed by Contractor beyond that specified and permitted herein. Contractor shall protect survey control points prior to starting site work and preserve permanent reference points during construction. Contractor shall not relocate site reference points without prior written approval from Engineer.

B. Contractor shall promptly report to Engineer the loss, damage, or destruction of any reference point or relocation required because of changes in grades or other reasons. Contractor shall replace dislocated survey control points based on original survey control at no additional cost to Owner. Replacement of dislocated survey control points shall be done by a licensed land surveyor in the State of Washington. Survey accuracy used to relocate disturbed control points shall be equal to or better than that used to set the original control. At a minimum, control points shall be reset to within the tolerance described in Paragraph 3.04C.

C. Contractor shall be responsible for the accuracy of all surveys performed with his forces, including those of his subcontractors. Any work performed not conforming to the lines, grades, elevations and locations indicated on the contract Drawings due to survey error shall be the responsibility of Contractor, and Contractor shall repair or relocate such work to its proper location at no additional cost to Owner.

3.04 SURVEY REQUIREMENTS

A. Contractor shall reference survey and site reference points to the provided control monuments and record locations of survey control points, with horizontal and vertical data, on Project Record Documents.

B. Contractor shall with its own forces obtain working or construction lines or grades as needed.

C. All control surveys for elevation shall be +0.01 foot and, for horizontal, control angles shall be to the nearest 20 seconds +10 seconds, and measured distances shall be to +0.01 foot. All measurement surveys for elevation shall be to the nearest 0.01 foot +0.005 foot and for horizontal distances shall be to + 0.1 foot.

D. Contractor shall provide all materials as required to properly perform the surveys, including, but not limited to, instruments, tapes, rods, measures, mounts and tripods, stakes and hubs,

nails, ribbons, other reference markers, and all else as required. All material shall be of good professional quality and in first-class condition.

E. All lasers, transits, and other instruments shall be calibrated and maintained in accurate calibration throughout the execution of the work.

F. Contractor shall furnish all materials and accessories (i.e., grade markers, stakes, pins, spikes, etc.) required for the proper location of grade points and line.

G. All marks given shall be carefully preserved and, if destroyed or removed without Engineer's approval, they shall be reset, if necessary, at Contractor's expense.

3.05 SURVEY OF COMPLETED EXCAVATION

A. At the completion of excavation in all areas, Contractor shall at a minimum survey the edge of excavation, surface grid at 10 foot centers and changes in grade to document the final excavation surface.

3.06 SURVEY OF COMPLETED CONSTRUCTION

A. At the completion of creek restoration in all areas, contractor shall survey the creek bed and banks, using a grid at a minimum of 25-foot centers plus key grade breaks, to document the final restored creek configuration, access road to remain in place, and all structures (such as boulder cascades and large woody debris) in the creek.

3.07 PAYMENT AS AN INCIDENTAL

A. The cost to Contractor of all work and delays occasioned by giving lines and grades, or making other necessary measurements, will be considered as having been included in the lump sum price for the work.

END OF SECTION

SECTION 01780

RECORD DRAWINGS

PART 1 GENERAL

1.01 DESCRIPTION

A. Field Record Drawings.

1. Field Record Drawings shall be completed and submitted to Engineer, within 14 calendar days of final acceptance. All Drawings from the original Contract Drawings set shall be included, including the drawings where no changes were made. Engineer will review all field record drawings for accuracy and clarity. The Field Record Drawings will be returned to Contractor if corrections are necessary. Contractor shall make all corrections and shall return the Field Record Drawings within 7 calendar days of receipt.

1.02 SUBMITTALS

A. Field Record Drawings shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 FIELD RECORD DRAWINGS

A. Contractor shall keep at the construction site two complete sets of full-size blueline prints of the Contract Drawings, reproduced at Contractor expense, one for Contractor's use, one for Engineer. During construction, both sets of prints shall be marked to show all deviations in actual construction from the Contract Drawings. The color red shall be used to indicate all additions and green to indicate all deletions. The drawings shall show the following information but not be limited thereto:

1. The locations and description of any structures, pipelines, utility lines and other installations of any kind or description known to exist within the construction area and not previously shown on the Contract Drawings. The location includes dimensions and/or survey coordinates to permanent features.

2. The location, orientation, topography and grade of all stream restoration features installed or affected as part of the project construction.

3. All changes or modifications from the original design and from the final inspection.

B. Where Contract Drawings or Specifications allow options, only the option actually used in the construction shall be shown on the record drawings. The option not used shall be deleted.

C. These deviations shall be shown in the same general detail utilized in the Contract Drawings. Marking of the prints shall be pursued continuously during construction to keep them up to date. The resulting field-marked prints and data shall be referred to and marked as "Field Record Drawings," and shall be used for no other purpose. They shall be made available for inspection by Engineer whenever requested during construction and shall be jointly inspected for accuracy and completeness by Engineer and a responsible representative of Contractor prior to submission of each monthly pay estimate. Failure to keep the Field Record Drawings current shall be sufficient justification to withhold 10 percent of the final payment until satisfactory drawings are received.

3.02 PAYMENT

A. All costs incurred by Contractor in the preparation and furnishing of Field Record Drawings shall be included in the contract price and no separate measurement or payment will be made for this work. Approval and acceptance of the Field Record Drawings shall be accomplished before final payment is made to Contractor.

END OF SECTION

SECTION 02111

EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Contractor shall perform all excavation of contaminated material within the grading limits of the project, to the lines and grades indicated on the Drawings. Construction schedule constraints in performing the work are provided in Section 01145 SITE-SPECIFIC REQUIREMENTS.

B. The creek bed excavation work consists of excavation and temporary storage of contaminated sediment, soil, gravel, cobbles, and root balls in the bed of Powder Mill Creek, to the limits of the lines and grades shown on the Drawings. Material to be excavated is located in and around riprap boulders in much of the creek bed and is found adhering to riprap boulders and embedded in the root balls of plant material growing in the creek bed. The excavation work shall be conducted in and around the existing riprap boulders as shown on the Drawings.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only. The most recent version of the publication and test method shall be applicable in all cases.

1. PROJECT DOCUMENTS

   a. Basis of Design Report and Site Management Plan, URS 2006

2. CODE OF FEDERAL REGULATIONS (CFR)

   a. 40 CFR 302 Designation, Reportable Quantities, and Notification

1.03 SUBMITTALS

A. None.

1.04 REGULATORY REQUIREMENTS

A. Permits and Licenses

1. Contractor shall comply with substantive requirements of relevant Federal, State, and local permits for excavation and storage of contaminated material. Permits need not be obtained.

B. Air Emissions

1. Air emissions shall be monitored and controlled in accordance with Section 01351 SAFETY, HEALTH, AND EMERGENCY RESPONSE.

C. Waste Handling and Temporary Storage

1. Waste handling and temporary storage shall be conducted in accordance with Section 01500 TEMPORARY CONSTRUCTION FACILITIES.

PART 2 PRODUCTS

2.01 BACKFILL MATERIAL

A. All backfill material shall comply with the requirements of Section 02940 STREAM RESTORATION.

2.02 DRAINAGE NET MATERIAL

A. The Drainage Net material shall be a Poly-Flex GN-200 or equal. The polymer used to manufacture the geonet shall be non-thermally degraded polyethylene which is clean and free of any foreign contaminants. The manufactured geonet shall conform to the property requirements listed in Table 02111-1 and shall be free of defects including tears, nodules or other manufacturing defects that may affect its serviceability.

Table 02111-1
GEONET PROPERTIES

Property	Test Method	Test Value
Polymer Density, minimum	ASTM D 1505	0.940 gram/cubic centimeter
Polymer Melt Index, maximum	ASTM D 1238	1.1 gram/10 minutes
Carbon Black Content	ASTM D 1603	2.0 percent
Transmissivity, minimum	ASTM D 4716	5 gal/min/ft

2.03 GEOTEXTILE FILTER FABRIC

A. Geotextile shall be a nonwoven pervious sheet of polymeric material and shall consist of long-chain synthetic polymers composed of at least 95 percent by weight polyolefins, polyesters, or polyamides. The use of woven slit film geotextiles (i.e., geotextiles made from yarns of a flat, tape-like character) will not be allowed.

B. Geotextiles shall meet the requirements specified in Table 02111-2. Where applicable, Table 02111-2 property values represent minimum average roll values (MARV) in the weakest principal direction. Values for apparent opening size represent the range of average roll values.

Table 02111-2
GEOTEXTILE PHYSICAL PROPERTIES

Property	Minimum Average Roll Value (MARV)	Test Method
Weight	12 oz/sq yd	ASTM D 3776
Grab Tensile	285 lb	ASTM D 4632
Puncture Strength	200 lb	ASTM D 4833
Apparent Opening Size, US Sieve	120	ASTM D 4751
Flow Rate	80 gpm/sf	ASTM D 4491
Ultraviolet Resistance (percent strength retained at 500 hours)	70	ASTM D 4355

2.04 SPILL RESPONSE MATERIALS

A. Contractor shall provide spill response materials including, but not limited to, the following: containers, adsorbents, shovels, and personal protective equipment. Spill response materials shall be available at all times in which hazardous materials/wastes are being handled or transported. Spill response materials shall be compatible with the type of materials and contaminants being handled.

2.05 GEOMEMBRANE LINER

A. Geomembrane liner shall be unreinforced High Density Polyethylene (HDPE) and fabricated to minimize factory and field seams. The sheets shall be free of cuts, abrasions, holes, blisters, contaminants and other imperfections.

B. Geomembrane liner shall meet the requirements specified in Table 02111-3. Where applicable, Table 02111-3 property values represent minimum average roll values (MARV) in the weakest principal direction.

Table 02111-3
HDPE GEOMEMBRANE PROPERTIES

Property	Minimum Average Roll Value (MARV)	Test Method
Thickness	40 mils	ASTM D 5199
Density	0.940 g/cc	ASTM D 1505
Tensile Properties		
-yield stress	84 lb/in	ASTM D 6693
-break stress	152 lb/in	ASTM D 6693
-yield elong	12 %	ASTM D 6693
-break elong	700 %	ASTM D 6693
Tear Resistance (min avg)	28 lb	ASTM D 1004
Puncture Resistance (min avg)	72 lb	ASTM D 4833
Carbon Black Content	**2.0-3.0 percent**	**ASTM D 1603**

2.06 ALTERNATIVE DEWATERING FILTER

A. Depac™ dewatering filters may be substituted for the drainage net material and geotextile filter fabric material specified in paragraphs 2.02 DRAINAGE NET MATERIAL and 2.03 GEOTEXTILE FILTER FABRIC, respectively, where used in the interior of the roll-off storage units. Depac™ dewatering filters shall be as manufactured by PacTec, Inc. of Clinton, Louisiana (Phone 800-272-2832) and shall include a 12 oz geotextile filter fabric in the filter layer meeting the geotextile filter fabric requirements of paragraph 2.03 GEOTEXTILE FILTER FABRIC.

PART 3 EXECUTION

3.01 EXISTING STRUCTURES AND UTILITIES

A. No excavation shall be performed until existing site structures and utilities have been field located. Contractor shall take the necessary precautions to ensure no damage occurs to existing structures and utilities. Damage to existing structures and utilities resulting from Contractor's operations shall be repaired at no additional cost to Owner. Utilities encountered that were not previously shown or otherwise located shall not be disturbed without written approval from Owner.

3.02 CLEARING AND GRUBBING

A. Woody plant material growing within the limits of the lines and grades shown on the Drawings shall be cut 18 inches above the existing soil or sediment surface. The cut portion of the plant material shall be removed from the creek bed and disposed of as construction debris. During removal, Contractor shall minimize contact of the cut plant material with potentially contaminated sediment in the creek bed.

3.03 CONTAMINATED MATERIAL REMOVAL

A. Excavation

1. Areas of contamination shall be excavated to the depth and extent shown on the Drawings or as directed by Engineer in the field. Contractor will not be paid for excavation of materials beyond the lines and grades shown on the Drawings, or for extra backfill required because of over-excavation, unless directed by Engineer.

2. Contaminated material shall be removed to a nominal depth of 12 inches from existing grade in portions of the creek bed where sediment, soil and cobbles less than 12 inches in mean diameter are present. Contaminated material shall be removed from accessible void spaces between riprap boulders embedded in the bed and banks of the creek, after moving loose riprap boulders currently stacked on embedded riprap. Plant root balls embedded in removed material shall be removed along with the material.

3. Contaminated material shall be removed from voids in creek bank riprap to a vertical height on the bank of 18 inches from the existing grade.

4. Loose (i.e., not embedded) riprap boulders that are currently stacked on embedded riprap, leaning on embedded riprap in the creek bank, or lying loose on sediment shall

be moved and temporarily stored in a staging area within or near the creek bed to allow access to underlying sediment. These loose riprap boulders shall be cleaned of adhering sediment and reused during creek restoration in accordance with Section 02940 STREAM RESTORATION. Cleaning of riprap boulders shall be performed prior to contaminated sediment removal from the creek bed if water from the cleaning operation will enter the stream bed area. No cleaning of riprap boulders shall be performed downstream of the stream area to be cleaned and restored.

5. Any water used to clean loose riprap boulders or to facilitate removal of sediment from embedded riprap voids shall be recovered, treated, and discharged in accordance with paragraph 3.03D Dewatering and Water Generated Collection.

B. Maintaining Stable Creek Banks

1. Contractor shall make every effort to maintain stable creek banks in the area of excavation. Contractor shall exercise extreme care when excavating near steep banks and removing soil from voids between riprap boulders supporting creek banks. Contractor shall be prepared to maintain bank stability with additional riprap if indications of instability are observed by Contractor's personnel or Engineer.

C. Excavation Sequencing

1. Time is of the essence during contaminated material removal. Contractor shall make every effort to expedite contaminated material removal from the creek bed to the staging area, to minimize the potential for contaminant redistribution during unexpected storm events that could inundate the creek bed. Contractor shall be prepared for unexpected storm events in accordance with Section 01145 SITE-SPECIFIC REQUIREMENTS.

2. Contractor shall be prepared to stabilize the excavation for 48 hours prior to any backfill occurring. Engineer will collect and analyze confirmation samples from the base of the excavation and will approve the excavation for backfill, or require additional excavation at additional cost, within 48 hours of the completion of excavation.

D. Dewatering Water And Generated Water Collection

1. Dewatering at the point of excavation is required during contaminated material. Contractor shall be prepared to collect water originating as seepage from creek bed materials and water potentially generated by Contractor's methods to remove material. Substantial quantities of groundwater are not expected to enter the excavation in accordance with the findings of the Basis of Design Report. To the extent practical, excavated material shall be allowed to drain prior to removal from the creek bed. During the construction period, Contractor shall continuously remove all water from a point immediately upstream of the decant weir. Collected water shall be pumped to the temporary Construction Dewatering Water Storage, Treatment, and Discharge System described in Section 01560 CARE AND DIVERSION OF WATER.

3.04 HANDLING OF EXCAVATED MATERIAL

A. Excavated sediment, soil, cobbles less than 12 inches in mean diameter, and plant root balls shall be placed in roll-off containers equipped with drainage nets and geotextile filter fabrics and staged as shown on the Drawings and in accordance with paragraph 3.05 CONTAMINATED MATERIAL STORAGE.

B. Loose riprap moved within the creek bed area to allow access to sediment shall be cleaned and reused in accordance with paragraph 3.03A Excavation, and Section 02940 STREAM RESTORATION.

3.05 CONTAMINATED MATERIAL STORAGE

A. The following paragraphs describe acceptable methods of material storage. Storage units shall be in good condition and constructed of materials that are compatible with the material or liquid to be stored. If multiple storage units are required, each unit shall be clearly labeled with an identification number and a written log shall be kept to track the source of contaminated material in each temporary storage unit.

B. Stockpiles

1. Stockpiles shall not be used for storage of any contaminated material. Temporary stockpiles of clean imported material and stockpiles of construction debris shall be managed in accordance with Section 01410 ENVIRONMENTAL PROTECTION.

C. Roll-Off Units

1. All contaminated materials shall be stored in roll-off units equipped with geomembrane liner, drainage nets and geotextile filter fabrics as specified in paragraph 2.05 GEOMEMBRANE LINER, paragraph 2.02 DRAINAGE NET MATERIAL and paragraph 2.03 GEOTEXTILE FILTER FABRIC, respectively. Alternatively, the drainage net and geotextile filter fabric material may be replaced with DePac™ dewatering filters as specified in paragraph 2.06 ALTERNATIVE DEWATERING FILTER. Owner will supply 20-cubic yard roll-off containers. Contractor shall be responsible for processing and installing drainage net and geotextile dewatering system in each roll-off.

2. The geomembrane liner shall be placed in the empty roll-off storage unit to waterproof the container. The geomembrane liner shall cover the entire floor and sidewalls with one continuous panel. The panel shall be sized to overlap the top edge of the roll-off storage unit by a minimum of 2 feet on each side when the panel is flush with the roll-off unit's interior bottom and side surfaces. Care shall be taken during installation and during the contaminated soil storage period to ensure the geomembrane liner is not punctured.

3. Following placement of the geomembrane liner, a sump shall be constructed in each roll-off storage unit in one corner. The sump shall consist of drain gravel and a PVC riser as shown on the drawings. The PVC riser shall be slotted along the lower 2 feet of pipe as shown on the drawings. A minimum slot area of 5% of the pipe surface shall be used in the slotted portion of the PVC riser. Maximum slot width shall be 1/8". A

butyl rubber mat or similar pad material shall be placed between the riser pipe base and the 40-mil HPDE geomembrane as shown on the drawings.

4. After installation of the geomembrane liner and sump materials and prior to placement of contaminated soil material, the geonet shall be placed within the roll-off container. It shall be placed as shown on the drawings to cover all sides and bottom. Two layers of geotextile filter shall be placed above and completely cover the geonet prior to placement of contaminated soil material.

5. Following placement of the geomembrane, sump materials, geonet and geotextile filter fabrics, roll-off containers shall be filled in the creek vicinity (such as in the Creek-Side Laydown Area defined in Section 01550 TEMPORARY CONSTRUCTION FACILITIES). and subsequently moved to the Excavated Material Temporary Storage Area identified on the Drawings and specified in 01550 TEMPORARY CONSTRUCTION FACILITIES. Water leaking from the excavated materials shall not be permitted to drain onto the natural ground outside the limits of the creek bed area being cleaned. Transfer of excavated material to roll-off units from vacuum trucks or similar extraction and containment equipment shall be conducted away from the creek in the Excavated Material Temporary Storage Area as specified in Section 01550 TEMPORARY CONSTRUCTION FACILITIES.

D. Liquid Storage

1. Liquid collected from the excavation shall be directly pumped to the temporary Construction Dewatering Water Storage, Treatment, and Discharge System described in Section 01560 CARE AND DIVERSION OF WATER. Liquid storage containers shall be watertight and equipped with secondary containment. Following sample verification that discharge criteria have been met, effluent from the dewatering system shall be discharged to the Everett POTW manhole on site as described in Section 01560 CARE AND DIVERSION OF WATER. Sediment cleaned from liquid storage tanks shall be added to the roll-off units used to store and dewater excavated material.

3.06 SAMPLING

A. Sampling will be performed by Engineer in accordance with the Basis of Design Report and Site Management Plan.

3.07 SPILLS

A. In the event of a spill or release of a hazardous substance (as designated in 40 CFR 302), pollutant, contaminant, or oil (as governed by the Oil Pollution Act [OPA], 33 USC 2701 et seq.), Contractor shall notify Engineer and Owner immediately. Contractor shall comply with the environmental protection requirements shown on the Drawings and specified in Section 01410 ENVIRONMENTAL PROTECTION. Immediate containment actions shall be taken to minimize the effect of any spills or leaks. Cleanup shall be in accordance with applicable federal, state, and local regulations. As directed by Engineer, additional sampling and testing shall be performed to verify spills have been cleaned up. Spill cleanup and testing shall be done at no additional cost to Owner.

3.08 BACKFILL OF EXCAVATED AREAS

A. Backfill execution shall comply with the requirements of Section 02940 STREAM RESTORATION.

3.09 DISPOSAL REQUIREMENTS

A. Disposal of dewatered contaminated material contained in roll-off units, including both solids and liquid, will be performed separately by Owner. Contractor shall discharge effluent from the dewatering system referenced in paragraph 3.05D Liquid Storage and 3.03D Dewatering Water and Generated Water Collection to Everett POTW manhole on site as described in Section 01560 CARE AND DIVERSION OF WATER, following approval from Engineer based on sampling results.

END OF SECTION

SECTION 02921

SEEDING

PART 1 GENERAL

1.01 DESCRIPTION

A. This section describes Environmental Protection work required to minimize environmental pollution and damage resulting from Contractor's operations during construction.

1.02 REFERENCES

A. The publications listed herein form a part of this Specification to the extent referenced. The publications are referred to in the text by basic designation only. The most recent version of the publication and test method shall be applicable in all cases.

B. State of Washington Department of Agriculture "Rules for Seed Certification", 2000.

C. Washington State Department of Transportation (WSDOT): WSDOT - Standard Specifications for Road, Bridge, and Municipal Construction 2006, Division 9 Materials.

1.03 DEFINITIONS

A. Installer: Contractor, or a subcontractor to Contractor, shall act as the Installer, i.e., the party responsible for field handling, transporting, storing, and deploying of seed and fertilizer.

B. Manufacturer: The party also referred to as the supplier that is responsible for the production of the seed in accordance with this Specification.

1.04 SUBMITTALS

A. Prior to use on the site, Contractor shall submit to Engineer certification of the grass seed as outlined by the State of Washington Department of Agriculture "Rules for Seed Certification".

B. Prior to use on the site, Contractor shall furnish to Engineer a statement signed by the manufacturer certifying that each lot of seed has been tested by a recognized seed testing laboratory within six months of the date of delivery to the site.

PART 2 PRODUCTS

2.01 SEED

A. Grass seed shall conform to the standards for "Certified" grade seed or better as outlined by the State of Washington Department of Agriculture "Rules for Seed Certification".

B. The seed mixture and rate of application shall be as indicated in Table 02921-1.

C. The rate of application shall be 30 pounds Pure Live Seed per acre.

D. Seed that has become wet, moldy, or otherwise damaged in transit or storage shall not be accepted.

Table 02921-1
Seed Quantity And Mix

Common Name	Scientific Name	Percent Composition (by weight)
Colonial bentgrass	*Agrostis capillaris*	15
Creeping bentgrass	*Agrostis stolonifera*	10
Tufted hairgrass	*Deschampsia caespitosa*	10
Blue wildrye	*Elymus glaucus*	30
Native red fescue	*Festuca rubra var. rubra*	30
White clover	*Trifolium repens*	5

2.02 TACKIFIER

A. Tackifier shall be used as a tie-down for the seed mixture.

B. Tackifier shall be derived from natural organic plant sources containing no growth or germination inhibiting materials. Tackifier shall hydrate in water and readily blend with other slurry materials.

C. Apply tackifier at the Manufacturer's recommended rate.

2.03 FERTILIZER

A. Commercial fertilizer shall comply with the state fertilizer laws.

B. Fertilizer will be added to hydroseed mix at minimal amounts and shall possess nitrogen, phosphorus, and potassium in equal amounts to each other.

2.04 WATER

A. Water shall be the responsibility of Contractor, unless otherwise noted. Water shall not contain elements toxic to plant life.

2.02 HYDROSEEDING APPARATUS

A. The device for spreading fertilizer, seed, and tackifier shall be capable of uniformly distributing the material at the Manufacturer's specified rate for that product.

2.05 EROSION CONTROL MATTING

A. Erosion Control Matting shall be per Section 01410 ENVIRONMENTAL PROTECTION.

PART 3 EXECUTION

3.01 PREPARATION

A. Grade areas to be seeded to achieve the finished grades and grading drainage patterns indicated on the Drawings. Grading shall be accomplished in accordance with the requirements of Section 02940 STREAM RESTORATION and Section 01500 TEMPORARY CONSTRUCTION FACILITIES. Blend new surfaces to existing areas.

B. The ground to be seeded shall be free of large clods, roots and other material that may interfere with the work and subsequent maintenance operations. Hand picking may be required.

C. The Rolled Erosion Control Product shall be installed in accordance with the requirements of Section 01410 ENVIRONMENTAL PROTECTION.

D. Seeding shall not commence until Engineer has accepted the condition of the prepared areas.

3.02 APPLICATION

A. Weather Limitations:

1. Seeding operations shall not be permitted when wind velocities exceed 15 miles per hour;

2. Seed shall be sown only when the soil is moist and in proper condition to induce growth. No seeding shall be done when the ground is unduly wet, or otherwise not in a tillable condition; and

3. Seeding shall only be completed from August 15 until September 15. Seeding at other times of the year shall only be completed with written permission from Engineer.

B. Hydroseeding

1. Seed and fertilizer shall be added to water and thoroughly mixed at the rates specified;

2. The seed, fertilizer, and water shall be thoroughly mixed to produce a homogeneous slurry;

3. While the soil is still loose and moist, the seed, fertilizer, and water slurry shall be uniformly broadcast under pressure over the nominated area at a rate of 30 pounds per acre using a hydroseeding apparatus;

4. Carefully regulate the flow rate and go over the area twice, applying half the seed with each application. The first application shall be from east to west and the second from north to south to ensure uniformity.

C. Watering:

1. Newly seeded areas shall not be watered to force seed germination, but only to sustain growth.

2. Vegetated areas shall be watered so as to provide optimum growth conditions for the establishment of the grass.

3. Start watering within 5 working days after completing the seeded area, or once the seeds have germinated.

4. Run-off and puddling shall be prevented.

D. Maintenance

1. Maintain the seeded areas in a satisfactory condition until final acceptance by Engineer.

2. Maintenance shall include:

a. Watering vegetated areas where the establishment of the grass stand does not appear to be developing satisfactorily; and

b. Filling and leveling where erosion has washed an area away.

3. If in the opinion of the Engineer, repeat hydroseeding or repair is necessary due to Contractor's negligence, carelessness or failure to provide maintenance, then the work shall be at Contractor's sole expense.

4. Repeat hydroseeding or repair required due to factors determined by Engineer to be beyond the control of Contractor shall be paid for under the appropriate contract pay items.

3.03 ACCEPTANCE

A. Contractor retains all ownership and responsibility for seeding until written acceptance by Engineer.

B. Engineer will accept the seeding when:

1. The application or installation is complete;

2. Documentation is complete;

3. Verification of the adequacy of all repairs including associated vegetation, is complete; and

4. The required written seed certification documents have been received by Engineer.

END OF SECTION

SECTION 02930

EXTERIOR PLANTING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section consists of furnishing all labor, equipment, and materials to establish trees, shrubs, and hardwood cuttings as noted on the Drawings and in the plant list. Any substantive variance to this specification due to unforeseen conditions encountered on the site, weather conditions, plant availability, other construction activities, etc. must be approved by Engineer.

B. Areas outside the limit of disturbance shall be protected from damage by Contractor. Any disturbance of trees, shrubs, or wetland areas outside the limit of disturbance shown on the Drawings shall be restored by Contractor.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. The most recent version of the publication and test method shall be applicable in all cases.

1. AMERICAN NURSERY AND LANDSCAPE ASSOCIATION (ANLA)

   a. ANLA Z60.1 American Standard for Nursery Stock

2. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

   a. ANSI A300 Tree Care Operations - Trees, Shrubs and other Woody Plant Maintenance

3. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

   a. ASTM C 602 Agricultural Liming Materials

   b. ASTM D 4972 pH of Soils

   c. ASTM D 5034 Breaking Strength and Elongation of Textile Fabrics (Grab Test)

   d. ASTM D 5035 Breaking Force and Elongation of Textile Fabrics (Strip Method)

   e. ASTM D 5268 Topsoil Used for Landscaping Purposes

f. ASTM D 5883 Use of Rotary Kiln Produced Expanded Shale, Clay or Slate (ESCS) as a Mineral Amendment in Topsoil Used for Landscaping and Related Purposes

1.03 SUBMITTALS

A. Proposed Plant Sources

1. Within 10 days after award of the contract, submit a complete list of plant materials proposed to be provided demonstrating conformance with the requirements specified. Include the names and address of all nurseries.

B. Product Certificates

1. Plant Materials List – Submit documentation at least 10 days prior to start of work under this section that plant materials have been ordered. Arrange procedure for inspection of plant material at time of submission.

2. Have copies of vendor's invoices or packing slips for all plants on site during installation. Invoice or packing slip should list species by scientific name, quantity, and date delivered.

C. Maintenance Record

1. Submit record of maintenance work performed, quantity of plant losses, and replacements; and diagnosis of unhealthy plant material.

1.04 DELIVERY, INSPECTION, STORAGE, AND HANDLING

A. Notification

1. Contractor must notify 48 hours or more in advance of deliveries to arrange for inspection.

B. Plant Materials

1. Transportation: During shipping, plants shall be packed to provide protection against climate extreme, breakage and drying. Proper ventilation and prevention of damage to bark, branches, and root systems, must be ensured.

2. Scheduling and Storage: Plants shall be delivered as close to planting as possible. If there is unavoidable delay, Contractor will be provided compensation of the added expense of storing plants, either on or off-site, unless Contractor is the cause of delay. Plants in storage must be protected against any condition that is detrimental to their continued health and vigor.

3. Handling: Plant materials shall not be handled by the trunk, limbs, or foliage but only by the container, ball, box or other protective structure.

4. Labels: Plants shall have durable, legible labels stating correct scientific name and size. Ten percent of container grown plants in individual pots shall be labeled. Plants supplied in flats, rack, boxes, bags, or bundles shall have one label per group.

C. Inspection

1. Plants shall be subject to inspection and approval for conformance to specifications at time of delivery on-site. Approval of plant materials at any time shall not impair the subsequent right to inspection and rejection during progress of the work.

2. Plants inspected on site and rejected for not meeting specification must be removed immediately from site, or red-tagged and removed as soon as possible.

1.05 WARRANTY

A. Installed plant material shall have a warranty for plant growth to be in a vigorous growing condition for a minimum 12 month period after initial planting. A minimum 12-month calendar time period for the warranty of plant growth shall be provided regardless of the contract time period. When plant material is determined to be unhealthy in accordance with paragraph 3.07 PLANT ESTABLISHMENT PERIOD, it shall be replaced once under this warranty.

PART 2 PRODUCTS

2.01 PLANT MATERIAL

A. Plant Material Classification

1. Plants shall be nursery grown in accordance with good horticultural practices under climatic conditions similar to or more severe than those of the project site.

2. Plants shall be true to species and variety or subspecies. No cultivars or named varieties shall be used.

B. Plant List:

1. The plant materials shall be as shown in Table 02930-1.

Table 02930-1
Plant List

Quantity	Common Name	Scientific Name	Size	Spacing
Planting Zone A (approximately 945 square feet)				
10	Big-leaf maple	Acer macrophyllum	1 gal	9' OC
15	Red alder	Alnus rubra	1 gal	9' OC
10	Douglas-fir	Pseudotsuga menziesii	1 gal	9' OC
Planting Zone B (approximately 375 square feet)				
40	Scouler willow	*Salix scouleriana*	2' live stakes	Opportunistically amongst riprap (approx. 3' OC)
Planting Zone D (approximately 255 square feet)				
15	Salmonberry	*Rubus spectabilis*	1 gal	Clusters of 3, each cluster 9' OC
10	Western redcedar	*Thuja plicata*	1 gal	9' OC
Planting Zone E (approximately xxxx square feet)				
XX	Sitka willow	*Salix sitchensis*	2' live stakes	Opportunistically, (approx. 3' OC)

C. Growing Conditions

1. Plant material shall be native to the region and well suited to the growing conditions of the project site. Plant material shall be grown under climatic conditions similar to those at the project site within western Washington.

a. Container-Grown Plant Material

1) Containers shall include plastic pots, trays, or tubes. Plant material shall be grown in a container over time sufficient for new fibrous roots to have developed throughout the container and for the root mass to retain its shape and hold together when removed from the container. Plants must be true to container size and shall be grown in the specified container size for a period of no less than one growing season prior to delivery. Plants shall not be excessively root-bound.

b. Live Stakes

1) Cutting stock shall be gathered during the dormant period and installed within 7 calendar days of harvest. Cuttings shall not be gathered if temperatures are below 32 degrees F (0 degrees C). Cuttings shall be protected from sun, wind, freezing, drying or injury before and during planting. Cuttings shall be stored upright in water immediately after harvesting up until they are installed. Stored material shall be examined frequently for signs of disease and planted before dormant bud development.

2) Cuttings shall be 24 inches long (as specified in the plant lists) making the bottom cut slanted and below a dormant bud, and the top cut straight, 1/2 to 1 inch above a dormant bud. The diameter of pieces reserved for planting shall not be less than 1/2 inch thick.

c. Deciduous Trees

1) Plants shall be of typical form for the specified species. Height of branching shall bear a relationship to the size and species of tree specified and with the crown in good balance with the trunk. The trees shall not be "poled" or the leader removed.

2) Single stem: The trunk shall have a persistent main leader.

d. Deciduous Shrubs

1) Plants shall be of typical form for the specified species. Acceptable plant material shall be well shaped, with sufficient well-spaced side branches, and recognized by the trade as typical for the species grown in the region of the project.

e. Coniferous Trees

1) Plants shall be of typical form for the specified species. Coniferous trees shall not be "poled" or the leader removed.

D. Plant Material Size

1. Plant material shall be furnished in sizes indicated by the plans.

E. Plant Material Measurement

1. Plant material measurements shall be in accordance with ANLA Z60.1.

2.02 WATER

A. Unless otherwise directed, water used for watering plants shall be the responsibility of Contractor. Water shall not contain elements toxic to plant life.

PART 3 EXECUTION

3.01 INSTALLING PLANT MATERIAL TIME AND CONDITIONS

A. Deciduous Plant Material Time

1. Deciduous plant material shall be installed from October 15 to November 30.

B. Evergreen Plant Material Time

1. Evergreen plant material shall be installed from October 15 to November 30.

C. Cutting Plant Material Time

1. Cutting plant material shall be gathered and installed from November 15 to November 30.

D. Plant Material Conditions

1. When drought, excessive moisture, frozen ground, expected freezing air temperatures or other unsatisfactory conditions prevail, planting installation shall be stopped when directed. When special conditions warrant a variance to the planting operations, proposed planting times shall be submitted for approval by Engineer.

3.02 SITE PREPARATION

A. Topsoil shall be imported and placed in Planting Zone D in accordance with the requirements of Section 02940 STREAM RESTORATION. Planting shall not occur until after rolled erosion control fabric has been placed per Section 01410 ENVIRONMENTAL PROTECTION.

1. Layout

a. Planting zone boundaries A-D shall be staked on the project site by the Contractor at the locations shown on the Drawings before any excavation for planting is made. Planting zone boundaries shall be reviewed with the Engineer following staking. Planting shall not commence until approval from the Engineer is received indicating agreement with the staked planting zone boundaries.

B. Protecting Existing Vegetation

1. Existing trees, shrubs, and other plants that are to be preserved shall be fenced off or otherwise barricaded along the dripline to protect them during planting operations.

3.03 EXCAVATION

A. Obstructions Below Ground

1. When obstructions below ground affect the work, Contractor shall propose adjustments to plant material location, type of plant and planting method for review and approval by the Engineer's on-site representative.

B. Plant Pits

1. Plant pits for container plant material shall be dug to a depth equal to the height of the root mass as measured from the base of the root mass to the base of the plant trunk. Plant pits for bare-root plant material shall be dug to a depth equal to the height of the root system. All plant pits shall be dug at least twice as wide as the root mass or root system to allow for root expansion. The sides of planting pits shall be roughened to encourage root spread.

3.04 INSTALLATION

A. Setting Plant Material

1. All plant material shall be set plumb and held in position until sufficient soil has been firmly placed around root system or ball. The base of the plant shall be level with the surrounding ground.

a. Containerized Plant Material

1) Container plants shall be removed from their containers and the root mass gently loosened to prevent root-bound conditions. The base of containerized plants shall be set at the same grade as the surrounding soil; no roots should

be exposed after planting. The base of containerized plants shall not be buried deeper than final grade. Prior to setting the plant in the pit, a maximum one-fourth depth of the root mass, measured from the bottom, shall be spread apart to promote new root growth. Do not compact soil around plant. Water each plant thoroughly after installed, ensuring the roots become saturated. Contractor shall add soil as necessary to replace any fill that settles below final grading during watering.

B. Cuttings

1. Prepare a pilot hole into the soil with rebar (slightly smaller diameter than cutting) if cutting cannot be easily installed into the ground. Cuttings shall be inserted, angled end down 18 inches below ground leaving 6 inches above ground, or a minimum of one to two dormant buds above ground.

C. Watering

1. All plantings shall be watered immediately after backfilling, until saturated.

3.05 MAINTENANCE DURING PLANTING OPERATION

A. Plant material installed in the initial phase of planting shall be maintained in a healthy growing condition during installation. Installed plants shall be maintained to foster establishment and growth. The maintenance includes watering and adjusting plant position to counteract settling.

3.06 RESTORATION AND CLEANUP

A. Restoration

1. Turf areas, pavements and facilities that have been damaged from the planting operation shall be restored to original condition at Contractor's expense.

B. Cleanup

1. Excess and waste material generated from within the lateral limits of sediment removal shown on Drawing C-5 shall be managed as contaminated material in accordance with Section 02111. Excess waste material generated from outside these limits shall be managed and disposed of by Contractor as uncontaminated construction debris.

3.07 PLANT ESTABLISHMENT PERIOD

A. Commencement

1. Upon completion of the last day of the planting operation, the plant establishment period for maintaining installed plant material in a healthy growing condition shall commence and shall be in effect for a minimum of 12 months. Written calendar time period shall be furnished for the plant establishment period. When there is more than one plant establishment period due to plantings that occur at separate times, the boundaries of the planted area covered by each period shall be recorded and provided

to the Engineer. The plant establishment period shall be modified for inclement weather shut down periods, or for separate completion dates for different areas.

B. Maintenance During Establishment Period

1. The site shall be maintained by Contractor for 12 months after planting is finished. Maintenance of plant material shall include straightening plant material, pruning dead or broken branch tips; watering; eradicating weeds, insects and disease; and removing and replacing installed plants that are unhealthy and/or have been physically damaged beyond full recovery. Maintenance shall also include removal of litter or other coarse material that inhibits growth and establishment of installed plants.

2. At least one site visit should occur within two weeks of planting to make any adjustments to plant material. Two additional site visits will be made in April and September of 2007 to assess the survival of the plant material. Additional visits may be required for watering and plant replacement.

   a. Watering Plant Material

      1) The plant material shall be watered as necessary to prevent desiccation and to maintain an adequate supply of moisture within the root zone, until the end of November 2006. An adequate supply of moisture is estimated to be the equivalent of 0.5 inch absorbed water per week, delivered in the form of rain or augmented by watering. Runoff, puddling and wilting from the watering operations shall be prevented. Watering of other adjacent areas or existing plant material shall be prevented.

   b. Weeding

      1) Noxious weeds and persistent non-native plants that inhibit growth and establishment of installed vegetation shall be removed by hand or other method approved by Engineer.

   c. Plant Pit Settling

      1) When settling occurs to the backfill soil mixture, additional backfill soil shall be added to the plant pit or plant bed until the backfill level is equal to the surrounding grade. Serious settling that affects the setting of the plant in relation to the maximum depth at which it was grown requires replanting in accordance with paragraph 3.04 - INSTALLATION.

   d. Maintenance Record

      1) Contractor shall report site status and maintenance actions to the client after each site visit for the duration of the establishment period. A record shall be furnished describing the maintenance work performed, the quantity of plant losses, and the quantity of replacements made on each site visit.

C. Unhealthy Plant Material

1. A tree will be considered unhealthy or dead when the main leader has died back, or 25 percent or more of the branches have died. A shrub will be considered unhealthy or dead when 25 percent or more of the plant has died. Herbaceous plants shall be considered unhealthy or dead when the crown has not produced leaves or shoots during the growing season, or when the crown appears dried or decayed. Contractor shall determine the cause for unhealthy plant material and shall provide recommendations for replacement. Unhealthy or dead plant material shall be replaced prior to the following growing season.

D. Replacement Plant Material

1. Unless otherwise directed, plant material shall be provided for replacement in accordance with paragraph 2.01 - PLANT MATERIAL. Replacement plant material shall be installed in accordance with paragraph 3.04 - INSTALLATION, and recommendations in paragraph 3.07 - PLANT ESTABLISHMENT PERIOD. Plant material shall be replaced in accordance with paragraph 1.05 - WARRANTY. An extended plant establishment period shall not be required for replacement plant material.

END OF SECTION

SECTION 02940

STREAM RESTORATION

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Work under this section consists of structural improvements to rebuild the streambed of Powder Mill Creek after sediment removal. This section includes descriptions of the stream structures and ancillary materials required to complete the improvements.

1.02 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only. The most recent version of the publication and test method shall be applicable in all cases.

1. PROJECT-SPECIFIC REFERENCES

   a. Basis of Design Report and Site Management Plan, URS 2006

2. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

   a. ASTM C 127 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

   b. ASTM C 131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

3. AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS

   a. AASHTO T-104 Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

4. U.S. ARMY CORPS OF ENGINEERS

   a. CRD-C-148 Method of Testing Stone for Expansive Breakdown on Soaking in Ethylene Glycol

1.03 SUBMITTALS

A. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

1. Top soil.

2. Filter gravel.

3. One set of cylinders from casting pour that demonstrate required concrete strength.

B. For the following materials, documentation demonstrating compliance with specifications shall be submitted prior to delivery to the site:

1. Timber logs and timber logs with rootwads.

2. Boulders.

3. River Rock.

4. 9-Inch Rock.

PART 2 PRODUCTS

2.01 TOPSOIL

A. Topsoil shall be placed in Planting Section D as shown on the Drawings. Suitable topsoil is defined as selectively excavated, natural, friable, loamy soil that is representative of topsoil in the vicinity that produces heavy growths of crops, grass, or other vegetation and is reasonably free from underlying subsoil, clay lumps, objectionable weeds, litter, brush, matted roots, toxic substances, or any material that might be harmful to plant growth or be a hindrance to grading, planting, or maintenance operations. Soils from ditch bottoms, drained ponds, or eroded areas, handled when too wet or soggy are not acceptable.

B. Topsoil shall not contain more than 5-percent by volume of stones, stumps, or other objects larger than 1 inch in any dimension and shall meet the gradation for topsoil shown in Table 02940-1. No particles shall exceed 4 inches in diameter. Topsoil shall have a pH value of between 6.0 and 7.5. If the pH is not within the 6.0 to 7.5 range, Contractor shall add material necessary to achieve that pH range. Topsoil shall contain from 5 to 15 percent organic matter. Organic material may be added to the soil to achieve the 5 to 15 percent organic matter content range. Topsoil shall be free from chemical contamination.

C. Topsoil shall consist of a silt loam to silty clay loam meeting the gradation shown in Table 02940-1.

Table 02940-1
TOPSOIL

Sieve Designation	Millimeters	Percent Passing
1 inch	25.4	95-100
No. 4	4.75	90-100
No. 100	0.150	50-70
No. 200[1]	0.074	35-70

[1]Up to 20 percent of the material by weight that passes the No. 200 sieve may be clay.

D. Topsoil that contains slag, cinders, stones, trash or other material larger than 1 inch in diameter will be rejected. Topsoil that contains viable weed plant material and weed plant parts will be rejected. Open soil amendment containers or wet soil amendments will be rejected. Unacceptable material shall be removed from the job site.

2.02 TIMBER LOGS

A. Contractor shall furnish timber logs of the type shown on the Drawings and as specified herein. The furnished timber logs shall be cedar or fir logs of recent vintage and free from insects, rot, and decay. Logs may be barked or un-barked.

B. Timber logs shall consist of either a straight timber bole or a straight timber bole with rootwad attached, as shown on the Drawings. Nominal rootwad diameter shall be a minimum of 2 times the timber bole diameter and a maximum of 4 times the timber bole diameter.

C. Each log (section) shall be anchored at each end as described in the Drawings. The log shall be placed so there are no voids beneath its entire length. Minor hand excavation is permitted to accommodate localized high spots on the ground or log.

D. Surface timber logs shall be 2-3 feet in diameter (diameter at breast height - DBH) and 6-8 feet long, including rootwad. Plug logs (subsurface timber logs) shall be nominally 1.5 feet in diameter and 14-16 feet long.

2.03 BOULDERS

A. Boulders include placed boulders in the channel and floodplain as well as boulders required to construct the boulder cascade.

B. Boulders shall be hard, sound, and durable. They shall be free from segregation, seams, cracks, and other defects tending to destroy resistance to weather. All Boulders shall be alluvial (not quarried). Except as noted on the Drawings, a round shape is not a requirement. Boulders shall conform to the soundness requirements specified in Table 02940-2 and size requirements in Table 02940-3.

Table 02940-2
BOULDER SOUNDNESS REQUIREMENTS

Test	Standard	Value
Specific Gravity	ASTM C-127	Min. 2.65
Soundness	AASHTO T104 (5.2.2)	Not greater than 5% loss
Accelerated Expansion	CRD-C-148	Not greater than 15% breakdown
Absorption	ASTM C-127	Not greater than 2%
L.A. Abrasion	ASTM C-131	Max. 20% loss @ 500 rev.

Table 02940-3
BOULDER SIZE REQUIREMENTS

Boulder Type	Nominal Diameter (feet)	Minimum Weight (lbs)	Average Weight (lbs)
Individually placed surface and subsurface boulders	3	2,000	2,500
Invert Rock	1	70	90
Cascade Boulder	2	550	700
Bottom of Boulder Cascade	4	4450	5500

C. Excavated and cleaned riprap from onsite may be used in place of any boulders where size and weight requirements are satisfied.

2.04 CHANNEL ROCK

A. Channel rock is specified as river rock, 9-inch rock, filter gravel or gap rock. River rock, 9-inch rock and filter gravel are used in the construction of the new stream channel. Filter gravel and gap rock are used in the construction of the boulder cascade.

B. Channel rocks shall be hard, sound, and durable, meeting the requirements of Table 02940-2. They shall be free from segregation, seams, cracks, and other defects tending to destroy resistance to weather. Channel rock shall be well-graded and consist of free-draining granular material free from various types of wood waste or other extraneous or objectionable materials.

C. Channel rock shall consist of screened material free from adherent coatings. The materials shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious substances.

D. River Rock: River rock shall be from an alluvial (river) source(s) and shall be rounded, washed, and shall conform to the gradation specified in Table 02940-4 before placement. A four percent variation over or under each size will be permitted. All percentages are by weight.

Table 02940-4
RIVER ROCK GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
15-inch	100
12-inch	60 - 100
6-inch	35 - 80
3-inch	10 - 45
1/4-inch	0 - 3

E. 9-Inch Rock: Rock shall be from an alluvial (river) source(s) and shall be rounded, washed, and shall conform to the gradation specified in Table 02940-5 before placement. A four percent variation over or under each size will be permitted. All percentages are by weight.

Table 02940-5
9-INCH ROCK GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
12-inch	100
9-inch	50 - 80
6-inch	30 - 50
1/4-inch	0

F. Filter Gravel: Filter gravel shall have the characteristics of size and shape that it readily compacts. It shall conform to the gradation specified in Table 02940-6 before placement. A four percent variation over or under each size will be permitted. All percentages are by weight.

Table 02940-6
FILTER GRAVEL GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
3-inch	100
1-inch	40 - 80
1/2-inch	20 - 50
1/4-inch	5 - 25
No. 10 sieve	3 - 15

G. Gap Rock: Gap rock shall conform to the gradation specified in Table 02940-7 before placement. A four percent variation over or under each size will be permitted. All percentages are by weight.

Table 02940-7
GAP ROCK GRADATION

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
12-inch	100
9-inch	60 - 80
6-inch	10 - 40
4-inch	0 - 10

2.05 STREAM FILL

A. Where additional material is required to grade the excavated area to the lines and grades shown on the Drawings for stream fill, the fill material shall consist of clean sand and gravel free of organics and other deleterious substances and meet the gradation requirements of Table 02940-8.

Table 02940-8
STREAM FILL BACKFILL

Sieve Designation	Percentage by Weight Passing Square-Mesh Sieve
4-inch	100
2-inch	75 - 100
No. 4 sieve	50 - 80
No. 40 sieve	0 - 30
No. 200 sieve	0 - 7

B. The stream fill areas may also be filled with individual pieces of cleaned rip rap provided they are completely surrounded by the stream fill material and all voids are filled. Tamp stream fill material firmly into place.

2.06 ANCHORS

A. The timber logs shall be anchored as shown in the Drawings. Anchors consist of concrete block anchors plus additional hardware as required. Concrete blocks may be cast-in-place or pre-cast.

B. Concrete Block Anchors

1. Concrete shall have a 28-day strength of 3,000 psi and shall use Type V Portland cement.

2. Pre-cast anchors shall be equal in weight to the cast-in-place concrete anchors specified on the Drawings. Contractor shall provide shop drawings of the proposed pre-cast concrete anchors.

3. The concrete shall be fastened to the timber as shown in the Drawings, using either steel eye bolts or all-thread. Any of the fastening systems shown in the Drawings are acceptable in any of the anchors, as long as the required depth and centerline offset is maintained.

4. Holes drilled through the logs for the installation of the anchor fastener shall be approximately 1/3 of the nominal log diameter up from the bottom of the log.

2.07 GEOTEXTILE FABRIC

A. Geotextile fabric in the boulder cascade and rock sills shall be non-woven and shall meet the requirements of Table 02940-5.

B. All geotextile properties are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in the table).

Table 02940-5
GEOTEXTILE FABRIC FOR SEPARATION

Geotextile Property	Test Method	Requirements Non-woven
AOS	ASTM D4751	#100 US sieve (0.15 mm) max.
Water Permittivity	ASTM D4491	0.7 sec^{-1} min.
Grab Tensile Strength, min. in machine and x-machine direction	ASTM D4632	250 lbs. / 160 lbs. min.
Seam Breaking Strength	ASTM D4632	220 lbs. min
Puncture Resistance	ASTM D4833	80 lbs. min.
Tear Strength	ASTM D4533	80 lbs. min.
Ultraviolet (UV) Radiation Stability	ASTM D4355	Min. 70% strength retained after 500 hours in weatherometer

PART 3 EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

A. This section describes installation requirements for streambed construction. Except as noted, the materials used for construction shall be as specified in PART 2 PRODUCTS. Construction schedule constraints in performing various portions of the work are provided in Section 01145 SITE-SPECIFIC REQUIREMENTS.

3.02 CHANNEL CONSTRUCTION

A. The general channel shape consists of

1. A low flow channel with a two-foot bottom, 2:1 (H:V) side slopes and one foot deep;

2. A main flow channel above the low flow channel with 3:1 (H:V) side slopes and one foot deep; and

3. A freeboard channel with 10:1 (H:V) side slopes that shall extend to meet existing streambanks. The freeboard channel shall be a minimum of 1 foot deep (above the low flow and main flow channel). If the streambanks are nearer than 10 feet on either side (less than 31 feet side to side), the side slope shall be steepened so as to maintain the minimum one foot depth.

B. The general channel materials, comprising the low flow and main flow channel area, consist of:

1. A 6-inch deep subgrade layer of filter gravel, overlain by

2. A 12-inch deep layer of river rock, finished with

3. A 3-inch finish of 9-inch rock to fill in interstices.

C. The existing (post-sediment removal) channel shall be filled with Stream Fill as necessary to meet the grade elevation required for the channel section. The side slopes of the freeboard

area shall be finished with a 12-inch layer of topsoil and planted as shown in the Drawings.

D. Where excavation is required below the depth necessary for contaminated sediment removal, treat excavated material as contaminated per Section 02111 EXCAVATION AND HANDLING OF CONTAMINATED MATERIAL.

3.03 BOULDERS

A. Boulders shall be placed as shown on the Drawings or as directed by Engineer. Boulders shall be placed so they are embedded in the channel materials one foot deep with two feet extending above the channel surface. Each boulder may, at Engineer's discretion, be adjusted in orientation at the time of installation.

B. Adjacent boulders shall be spaced no more than 2-feet apart. In two locations shown in the Drawings, boulders shall directly abut each other.

1. Four 3-foot boulders downstream of the stilling basin on the eastern side of the excavated area.

2. Several 2- and 3-foot boulders and two 4-foot boulders at the downstream end of the Boulder Cascade.

C. Boulders are placed in four general locations.

1. To define and roughen the channel from approximately station 0+00 to 0+55 or wherever the excavated bed is embedded riprap.

2. To provide channel roughness in addition to timber logs from approximately station 0+55 to 1+05 and station 1+17 to 1+30.

3. In the Boulder Cascade from approximately station 1+05 to 1+17.

4. In the area adjacent to the channel 5 to 15 feet downstream of the stilling basin.

3.04 CHANNEL ROCK

A. Channel rock shall be placed to the lines and grades shown on the Drawings or as directed by Engineer. To ensure that 9-inch diameter rock is included in the river rock, Contractor shall machine or hand place the last course of channel materials with 9-inch rock.

3.05 LOGS

A. The timber log shall be installed with the log embedded in the channel to a depth of half of the log diameter and anchored at each end. The streambed shall be excavated to receive the log and anchors. Backfill shall be completed using river rock tamped in place. If a gap exists under the timber log (between the bottom of the log and the streambed), the space shall be filled with river rock.

B. Logs shall be of two types: timber bole or timber bole with rootwad attached.

C. Logs–Timber Bole

1. Surface timber logs shall be installed so approximately half the diameter is buried in the channel rock and half is exposed about the channel/bank surface. The log shall be installed with the log contacting the surface and anchored at each end. If a gap exists under the timber log (between the bottom of the log and the ground surface), the space shall be filled with river rock.

D. Logs–Timber Bole with Rootwad Attached

1. Except that Contractor is required to over-excavate the channel to permit placement of the rootwad so that the bole is installed to the correct elevation, a timber bole with rootwad attached shall be completed according to paragraph 3.05C Logs–Timber Bole.

E. Plug Log

1. The plug log shall be placed so the center of the top of the log is at the elevation of the invert of the low flow channel, centered approximately across the channel, and anchored at both ends. Fill consisting of two foot boulders and river rock shall be placed on top of the ends of the log to match the up- and downstream channel configuration. Backfill around the log shall be river rock underlain by a 6-inch layer of filter gravel.

3.06 ANCHORS

A. There are three types of anchors shown in the Drawings. Type I anchor and Type II anchor have a layer of river rock between the anchor and the log. The Type III anchor lies immediately beneath (touching) the log.

B. A Type I anchor is placed beneath the centerline of the log; a Type II anchor is offset. With the permission of Engineer, a Type II anchor may replace a Type I anchor. At no time may a Type I anchor replace a Type II anchor; offset anchors shall remain offset anchors.

C. A Type III anchor is placed beneath the centerline of the log without the layer of river rock between the log and anchor. With the permission of Engineer, a Type I anchor or Type II anchor can replace a Type III. At no time may a Type III anchor replace a Type I anchor or Type II anchor.

3.07 BOULDER CASCADE

A. The object of the boulder cascade is to create a series of small pools to convey the stream base flow. The pool areas should be approximately 12 x 12-inches and the pool depths should be approximately 8 inches.

B. Boulder cascades shall be constructed from cascade boulders, invert rock, gap rock and filter gravel placed across the stream as shown on the Drawings.

C. The streambed shall be excavated to the depth of 12-inches below the existing elevation as shown on the Drawings. All surfaces that are to receive placement of cascade materials shall be undisturbed. Soils disturbed below lines and grades shown on the Drawings or directed

by Engineer shall be repaired prior to placement of cascade materials. If, in the opinion of Engineer, the disturbed native soils are suitable, these materials shall be compacted to specified grades and lines. If the materials are not suitable, the Contractor shall supply and install compacted filter gravel as specified in Table 02940-6.

D. Prior to placing the boulders, Contractor shall place 6-inches of compacted filter gravel fill in the bottom of the excavation. Upon the filter gravel surface, the base flow path shall be established by placing invert rock in a sinuous pattern on channel bottom as shown in the Drawings. Cascade boulders and gap rock shall be placed, as needed, to hold invert rocks in place. Filter gravel shall be tamped to fill interstices. After a stable base flow path is established, cascade boulders and gap rock shall then be placed on either side of the base flow path as shown on the Drawings and filter gravel shall be tamped in to fill the interstices.

E. The downstream end of the boulder cascade shall have a surface layer of boulders placed across the channel in decreasing diameter as shown in the Drawings. Abutting four-foot boulders shall be placed across the low flow channel so water flows between the rocks at their base. Adjacent and outboard of these two boulders shall be abutting two- and three-foot boulders to meet the existing streambanks. A subgrade layer of 3-foot boulders shall be installed immediately downstream of the 4-foot boulders. The top of these boulders may extend 6 inches above the invert of the channel downstream of the cascade.

3.08 PLACEMENT OF TOPSOIL

A. Topsoil Placement

1. Topsoil shall be uniformly distributed on the designated areas and evenly spread at a loose thickness that results in a final minimum thickness of 12 inches when compacted in place. Spreading shall be performed to allow planting to proceed with little additional soil preparation or tillage. Topsoil shall not be placed when the subgrade is frozen, excessively wet, extremely dry, or in a condition otherwise detrimental to proper grading or the proposed planting. Previously constructed cover soil grades shall be repaired, if necessary, so that the areas requiring topsoil placement conform to the cross sections indicated on the Drawings, upon completion of topsoil placement.

2. Light compaction of topsoil is required in all areas. Compaction shall consist of tracking in place with a Caterpillar Model D4 low ground pressure dozer, or equivalent or tamping in place with the backhoe bucket when access with a dozer is not practical.

B. Finished Grades

1. All areas, including filled sections and adjacent transition areas, shall be uniformly graded. The completed surface shall be reasonably smooth and free from major irregular surface changes. The completed thickness of the topsoil shall be a minimum of 12 inches. Topsoil shall not be 1 inch more or less than the specified thickness in all areas.

END OF SECTION

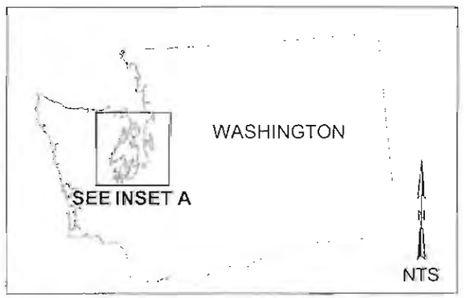
NO.	DATE	BY	REVISION DESCRIPTION

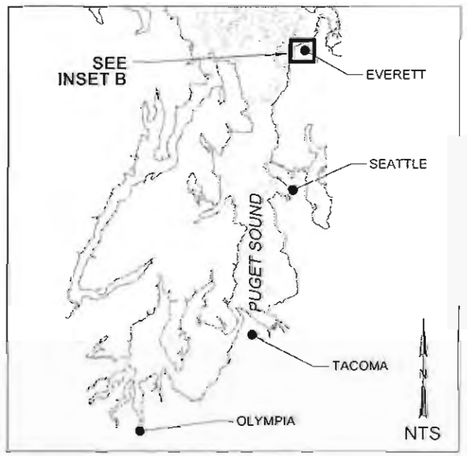
BOEING

BOEING COMMERCIAL AIRPLANES
EVERETT, WASHINGTON

POWDER MILL CREEK SEDIMENT REMOVAL

DRAWING INDEX





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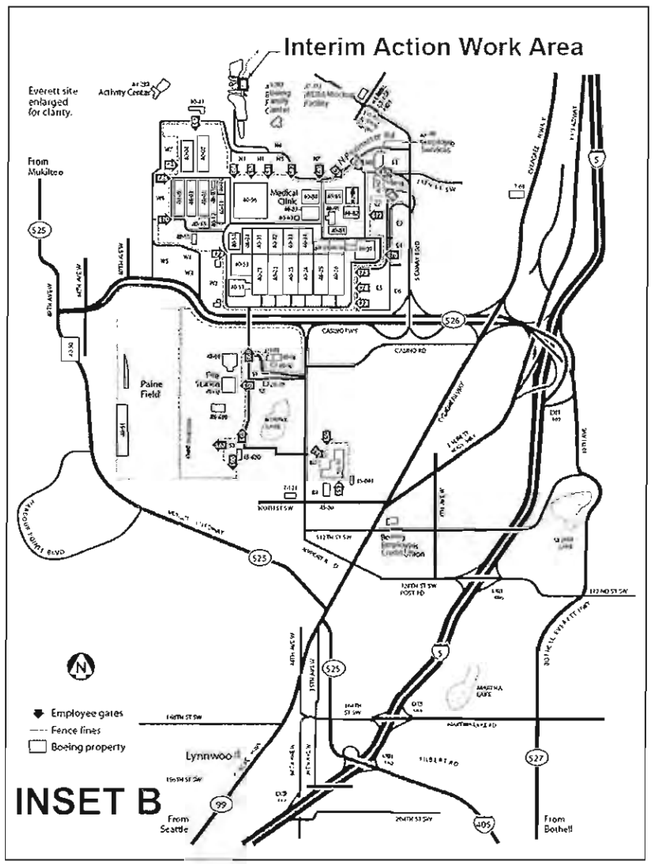

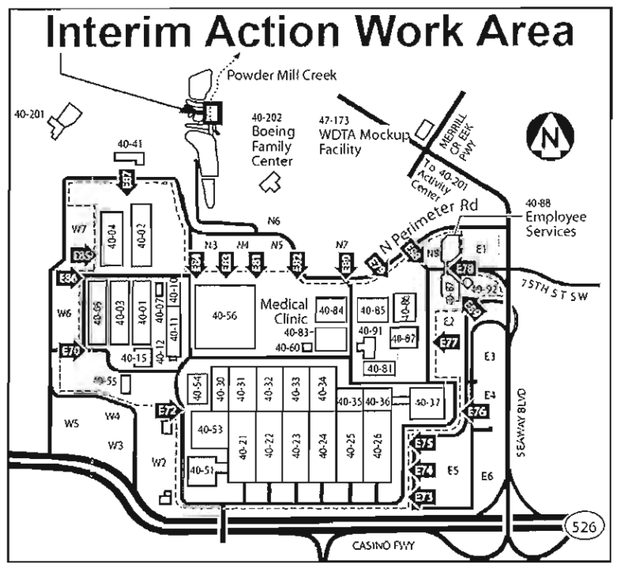

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

TITLE SHEET, VICINITY MAP,
AREA MAP, AND DRAWING INDEX

DESIGNED: MTM DRAWN: CFS CHECKED: DJH PROJECT ENGINEER: DJH APPROVED BY: MPM DATE: 3/10/2006	BOEING URS	SIZE: D	PLATE: G-1
		SHEET: 1 OF 13	

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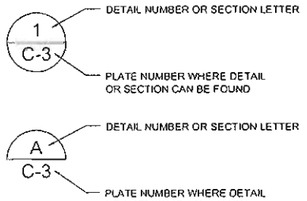
EDIT DATE: Apr. 13, 26

NO.	DATE	BY	REVISION DESCRIPTION



LEGEND:

- GROUND SURFACE CONTOURS IN FEET
- FENCE
- APPROXIMATE RIPRAP AREA BOUNDARY
- "ISLAND" REMOVAL AREA
- SEDIMENT REMOVAL LIMITS
- APPROXIMATE POWDER MILL CREEK THALWEG LINE
- CULVERT
- CLEARING LIMITS
- APPROXIMATE LAYDOWN AREA BOUNDARY
- SILT FENCE ALIGNMENT
- STABILIZED CONSTRUCTION ENTRANCE AREA
- APPROXIMATE ACCESS ROAD ALIGNMENT
- MONITORING WELL
- FLOW DIRECTION
- BOULDER
- ROOTWAD
- LOG
- BOULDER CASCADE
- PLANTING ZONES
- ACCESS ROAD
- DRAINAGE DITCH
- OUTLET PIPE
- 9-INCH ROCK
- FILTER GRAVEL
- RIVER ROCK
- UNDISTURBED SURFACE
- TRAPPED SEDIMENT
- TOPSOIL

ABBREVIATIONS

FT	FOOT OR FEET
IN	INCH OR INCHES
MAX	MAXIMUM
MIN	MINIMUM
NTS	NOT TO SCALE
TYP	TYPICAL
DIA	DIAMETER

GENERAL NOTES:

1. WORK SHALL BE SCHEDULED DURING ANTICIPATED DRY WEATHER TO THE MAXIMUM EXTENT POSSIBLE, TO MINIMIZE WATER FLOW IN THE PROJECT REACH OF POWDER MILL CREEK
2. EXISTING UTILITY LOCATIONS SHALL BE VERIFIED BY A PRE-CONSTRUCTION UTILITY LOCATE
3. ELEVATIONS SHALL BE BASED ON NATIONAL GEODETIC VERTICAL DATUM (NGVD) 1929
4. NORTHING AND EASTING COORDINATES SHALL BE BASED ON THE COORDINATE SYSTEM WASHINGTON STATE PLAN, NORTH ZONE, NORTH AMERICAN DATUM (NAD) 83
5. ALL WORK SHALL BE PEFORMED IN ACCORDANCE WITH OWNER DOCUMENTS "WATER QUALITY - SMALL CONSTRUCTION PROJECTS," "WATER QUALITY - MOBILE FUELING," AND "BOEING SERVICE PROVIDER MANUAL"
6. CONTRACTOR SHALL ADHERE TO OWNER BADGING, SECURITY, AND SITE ACCESS REQUIREMENTS DETAILED IN THE CONTRACT SPECIFICATIONS

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

ABBREVIATIONS AND LEGEND

DESIGNED: MTM
DRAWN: CFS
CHECKED: DJH
PROJECT ENGINEER: DJH
APPROVED BY: MPM
DATE: 3/10/2006

BOEING
URS

SIZE: D
PLATE: G-2
SHEET: 2 OF 13

FILENAME: Q:\geo\Boeing\Everett\Design\Powder Mill Creek\G-2 ABBRDY.dwg
EDIT DATE: 04/05/06 AT: 09:17

NO.	DATE	BY	REVISION DESCRIPTION

40-202

SEE NOTE 1

BOEING PARKING LOT

NORTH PERIMETER ROAD

EXCAVATED MATERIAL TEMPORARY STORAGE AREA (APPROXIMATE LOCATION)

IN-STREAM WORK AREA UNDER CONTRACT DOCUMENTS

POWDER MILL CREEK

CONCRETE SPILLWAY

CREEK ACCESS ROAD

SEDIMENTATION BASIN

STORMWATER DETENTION BASIN

POWDER MILL GULCH ACCESS ROAD

CREEKSIDE LAYDOWN AREA

HAUL ROUTE

STABILIZED CONSTRUCTION ENTRANCE (SEE SPECIFICATION SECTION 01410)

EVERETT POTW MANHOLE FOR DISCHARGE OF TREATED WATER

SUPPLEMENTARY LAYDOWN AREAS

SEE NOTE 2

NOTES:
1. PROTECT TRAFFIC AND PARKED VEHICLES DURING HAULING OPERATIONS.
2. WATER IS AVAILABLE APPROXIMATELY 1/2 MILE WEST OF INTERSECTION OF POWDER MILL GULCH ACCESS ROAD AND NORTH PERIMETER ROAD

SELECT LEGEND

- APPROXIMATE LAYDOWN AREA BOUNDARY
- HAUL ROUTE INDICATOR (TWO WAY TRAFFIC)
- STABILIZED CONSTRUCTION ENTRANCE AREA

0 40 80 160
SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

SITE PLAN,
HAUL ROUTE, AND LAYDOWN AREAS

DESIGNED	MTM
DRAWN	CFS
CHECKED	DJH
PROJECT ENGINEER	DJH
APPROVED BY	MPM
DATE	3/10/2006

BOEING
URS

SIZE	PLATE
D	C-1
SHEET: 3 OF 13	

FILENAME: Q:\proj\Boeing\Everett\Design\Powder Mill Creek\C-1 HAUL.dwg
EDIT DATE: 04/06/06
AT: 09:12

NO.	DATE	BY	REVISION DESCRIPTION

EXTENT OF RIPRAP

STILLING BASIN

CONCRETE SPILLWAY

CONCRETE WALL

EXISTING CONCRETE PAD FOR PUMP

POWDER MILL CREEK

WOOD LANDING

SEE NOTE 6

EXISTING SAMPLING STATION UTILITY BOX (REMOVE AND PRESERVE)

STAIRS

ROCK-LINED STORM CHANNEL SEE NOTE 2

APPROXIMATE ACCESS ROAD ALIGNMENT LIMITS SEE NOTE 1

EXISTING CULVERT LINED DITCH, 18-IN HALF-PIPE (REMOVE AND DISPOSE OF)

CLEARING LIMITS SEE NOTE 4

SEE NOTE 5

EGW075

EGW131

A C-6

GRAVEL WALKWAY

EXISTING GRAVEL ROAD

SOUTH OF THIS LINE FILL PLACEMENT ONLY (NO CUT ALLOWED)

EXISTING GRAVEL ROAD

STORM FLOW SEE NOTE 3

NOTES:

1. CONTRACTOR TO FIELD LOCATE ACCESS ROAD ALIGNMENT BASED ON APPROXIMATE LOCATION AND DIMENSIONS SHOWN. CLEAR ALIGNMENT AND REMOVE AND DISPOSE OF UNSUITABLE SURFACE SOILS. GRADE ALIGNMENT TO ACHIEVE MINIMUM 2 PERCENT SLOPE TOWARD ROCK-LINED STORMWATER CHANNEL. DURING GRADING, MAKE NO CUTS SOUTH OF THE LINE SHOWN TO PROTECT THE DAM. SURFACE ROAD WITH STABILIZED BASE COURSE, MINIMUM 1-FOOT THICKNESS.
2. CONSTRUCT ROCK-LINED STORMWATER CHANNEL USING STABILIZED BASE COURSE, MINIMUM 1-FOOT THICKNESS. CHANNEL TO BE A MINIMUM 18 INCHES DEEP AND 36 INCHES WIDE.
3. ROUTE ALL STORMWATER FLOW FROM EXISTING CHANNEL TO NEW ROCK-LINED CHANNEL.
4. CLEAR ONLY AREA NECESSARY TO COMPLETE ACCESS ROAD CONSTRUCTION. CONTRACTOR SHALL NOT CLEAR BEYOND CLEARING LIMIT SHOWN WITHOUT PRIOR WRITTEN APPROVAL OF ENGINEER.
5. MARK AND PROTECT MONITORING WELLS DURING ALL CONSTRUCTION WORK.
6. IN AREAS WHERE ROAD ALIGNMENT IS UNDERLAIN BY RIPRAP, REMOVE AND RESET RIPRAP AS NEEDED TO MAINTAIN SLOPE STABILITY.

SELECT LEGEND

- MONITORING WELL
- APPROXIMATE EXTENT OF RIPRAP
- APPROXIMATE POWDER MILL CREEK THALWEG LINE
- CULVERT
- CLEARING LIMITS
- ESTIMATED LOCATIONS OF DAM DRAINAGE SYSTEM PIPING BASED ON 1969 PLAN
- APPROXIMATE ACCESS ROAD ALIGNMENT

0 5 10 20

SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

CREEK ACCESS ROAD

DESIGNED: MTH	
DRAWN: CFS	
CHECKED: DJH	
PROJECT ENGINEER: DJH	
APPROVED BY: MTH	
DATE: 3/10/2006	

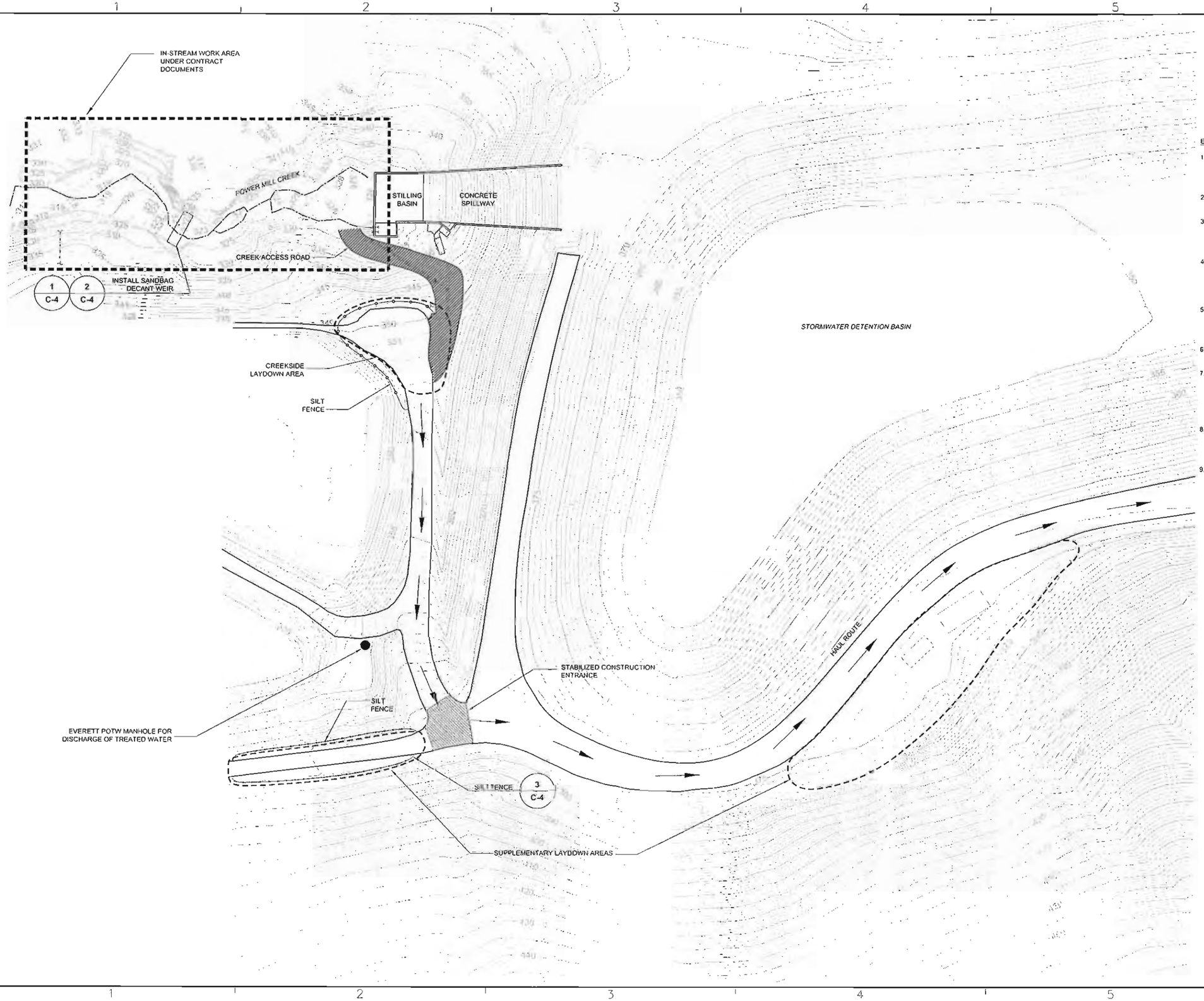
BOEING URS

SIZE	PLATE:
D	C-2

SHEET: 4 OF 13

File Name: Q:\Jobs\Boeing Everett\Design\Powder Mill Creek\C-2 ACCESS RD.dwg
Plot Date: 04/05/06

NO.	DATE	BY	REVISION DESCRIPTION



ENVIRONMENTAL PROTECTION NOTES :

1. CLEARING AND GRADING SHALL BE LIMITED TO THE BOUNDARIES SHOWN AND SHALL NOT ENCROACH ONTO WETLAND OR PEAT FILTER AREAS, WHICH SHALL BE MARKED PRIOR TO INCEPTION OF WORK.
2. INSTALL FILTER FABRIC FENCE AND SANDBAG DECANT WEIR PRIOR TO OTHER LAND DISTURBING ACTIVITIES
3. INSTALL PERIMETER FILTER FABRIC IN SECTIONS AS SHOWN IN DETAILS. EACH SECTION SHALL FOLLOW THE EXISTING LAND CONTOURS. SECTION ENDS SHALL BE TURNED UPSLOPE A MINIMUM DISTANCE OF 6 FEET.
4. FILTER FABRIC FENCE SHALL BE PURCHASED IN CONTINOUS ROLLS CUT TO THE LENGTHS OF THE SECTIONS. IF JOINTS ARE REQUIRED, FILTER FABRIC FENCE SHALL BE SPLICED AT A SUPPORT POST WITH A MINIMUM OF 6-INCH OVERLAP, WITH BOTH ENDS SECURED TO THE POST.
5. FILTER FABRIC FENCE SECTIONS SHALL BE INSTALLED IN CONTINUOUS TRENCHES APPROXIMATELY 8 INCHES WIDE BY 6-INCHES DEEP, BACKFILLED WITH GRAVEL. FENCE POSTS SHALL BE DRIVEN 12-INCHES MINIMUM INTO EXISTING GROUND.
6. 2-INCH BY 2-INCH WOODEN SUPPORT POSTS (OR EQUIVALENT) SHALL BE SPACED A MAXIMUM DISTANCE OF 6 FEET APART.
7. INSPECT FILTER FABRIC FENCE DAILY AND WITHIN 24 HOURS FOLLOWING ANY RAIN EVENT GREATER THAN 0.1 INCH IN A 24-HOUR PERIOD. REPAIR ANY DAMAGE IMMEDIATELY. CHECK UPHILL SIDE OF FENCE FOR CHANNELIZATION ALONG FENCE. REMOVE SEDIMENT ACCUMULATIONS WHEN GREATER THAN 6-INCHES DEEP.
8. KEY SANDBAG DECANT WEIR 6-INCHES INTO STREAMBED. DO NOT KEY INTO STREAM BANKS. PROVIDE SUMP ON UPSTREAM SIDE OF WEIR. REMOVE SEDIMENT AT LEAST DAILY. REPAIR ANY DAMAGE IMMEDIATELY.
9. STAGE GEOTEXTILE AND FILLED SANDBAGS IN PREPARATION TO PROTECT EXPOSED STREAMBED IN THE EVENT OF AN UNEXPECTED STORM EVENT, IN ACCORDANCE WITH CONTRACT SPECIFICATIONS. PROVIDE SUFFICIENT GEOTEXTILE TO COVER LATERAL LIMITS OF SEDIMENT REMOVED SHOWN ON DRAWING C-5, PLUS 5 FT IN ALL DIMENSIONS

SELECT LEGEND

- SILT FENCE ALIGNMENT
- APPROXIMATE LAYDOWN AREA BOUNDARIES
- HAUL ROUTE INDICATOR (TWO WAY TRAFFIC)

0 15 30 60
SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

ENVIRONMENTAL PROTECTION

DESIGNED: MTM DRAWN: CFS CHECKED: DJH PROJECT ENGINEER: DJH APPROVED BY: MPM DATE: 3/10/2006	BOEING URS	SIZE D	PLATE C-3
		SHEET 5 OF 13	

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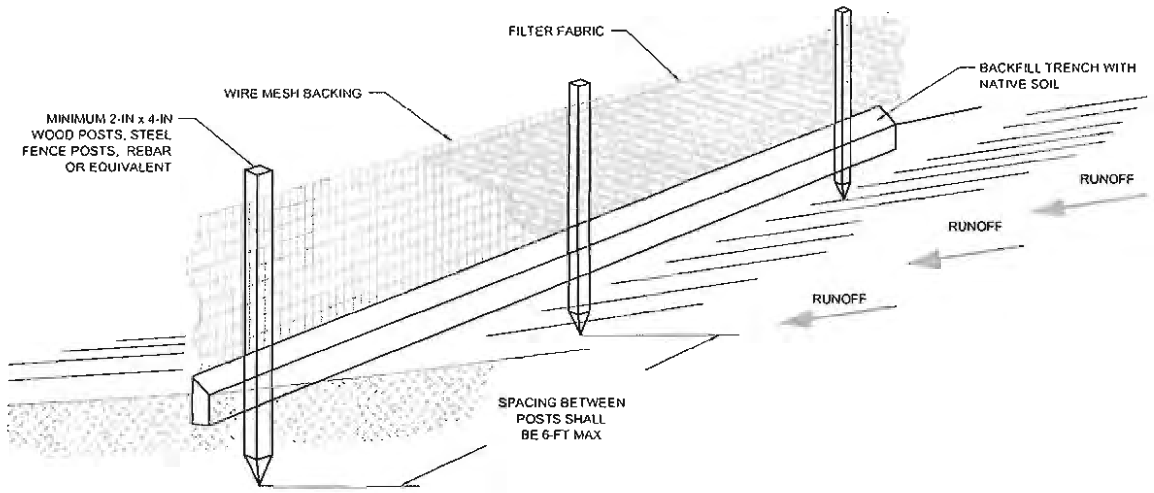
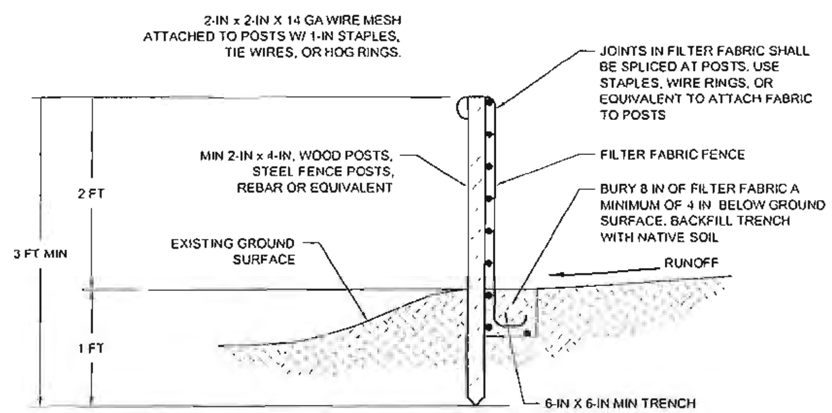




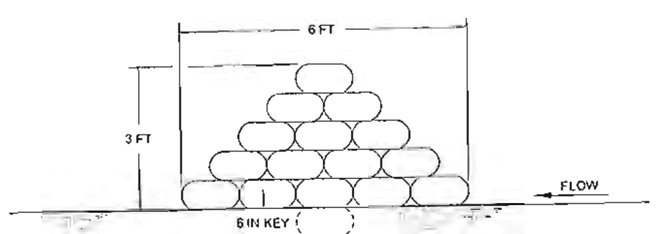
TEMPORARY FILTER FABRIC FENCE DETAILS

SCALE: NTS

3
C-3

SELECT LEGEND

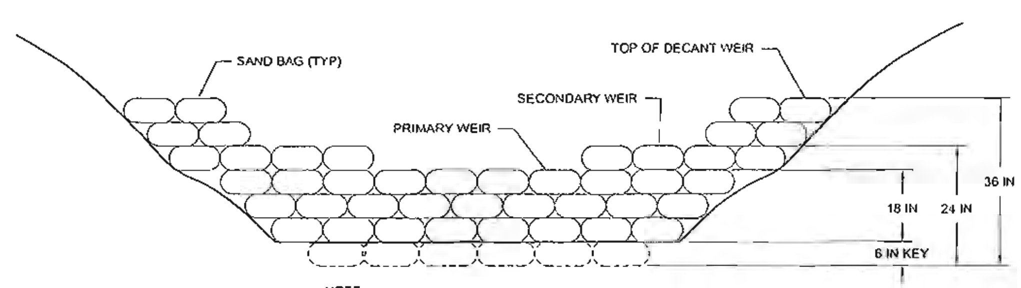
UNDISTURBED SURFACE



CROSS SECTION DECANT WEIR

0 1 2 4
SCALE IN FEET

2
C-3,C5



NOTE:
STACK SANDBAGS AGAINST BANKS MINIMIZING DISTURBING OF BANKS. DO NOT KEY INTO BANKS

VIEW DOWN STREAM DECANT WEIR

0 1 2 4
SCALE IN FEET

1
C-3,C-5

NO.	DATE	BY	REVISION DESCRIPTION

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

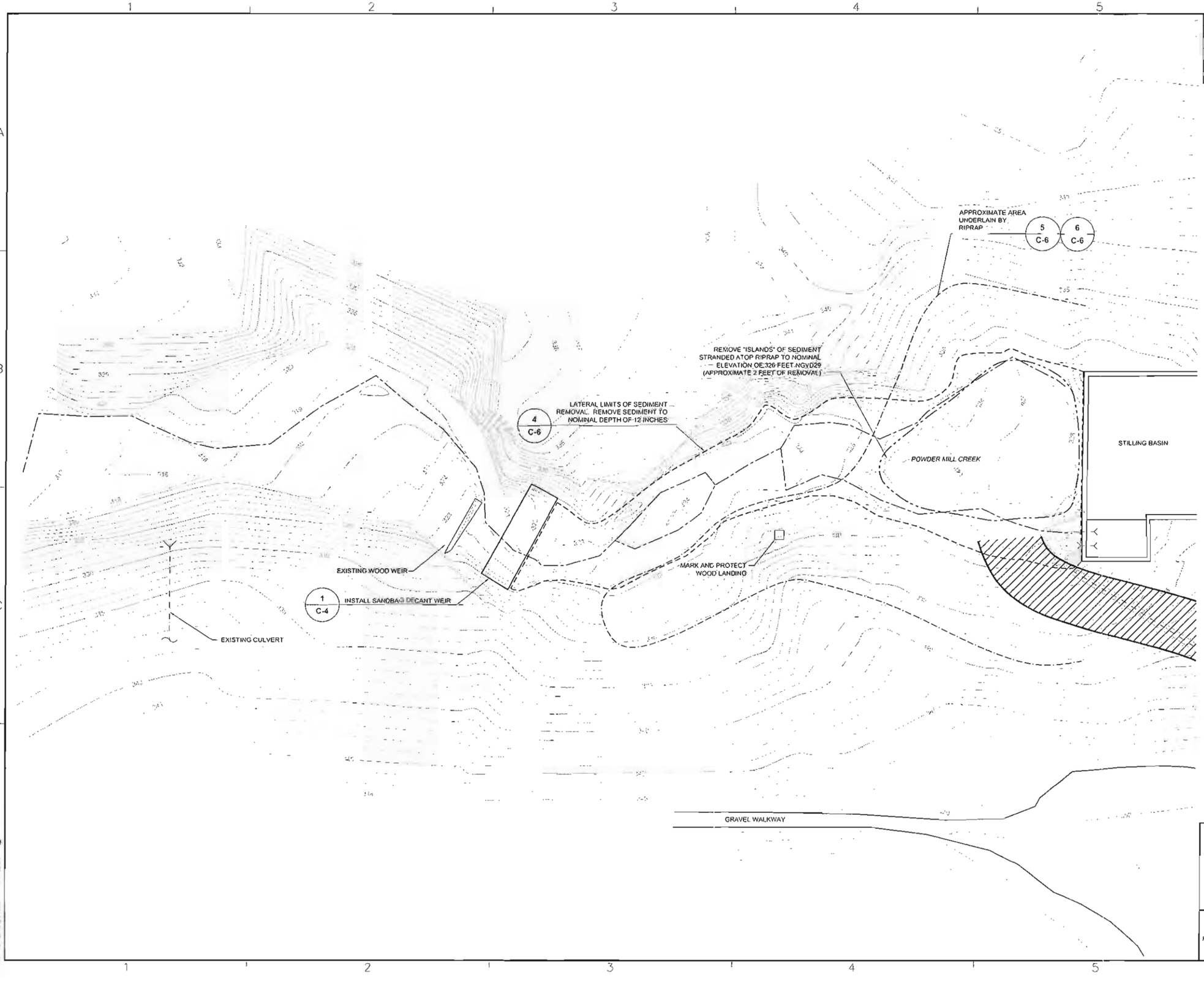
EROSION CONTROL NOTES AND DETAILS

DESIGNED: MTM
DRAWN: CFS
CHECKED: DJH
PROJECT ENGINEER: DJH
APPROVED BY: MPH
DATE: 3/10/2006

BOEING
URS

SIZE: D
PLATE: C-4
SHEET: 6 OF 13

NO.	DATE	BY	REVISION DESCRIPTION



NOTE:
TEMPORARY STORAGE OF REMOVED SEDIMENT SHALL BE IN ROLL-OFF UNITS EQUIPPED WITH DRAINAGE NETS PER 7 C-6

SELECT LEGEND

- APPROXIMATE RIPRAP AREA BOUNDARY
- "ISLAND" REMOVAL AREA
- SEDIMENT REMOVAL LIMITS
- APPROXIMATE THALWEG LINE

0 5 10 20
SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

SEDIMENT REMOVAL PLAN

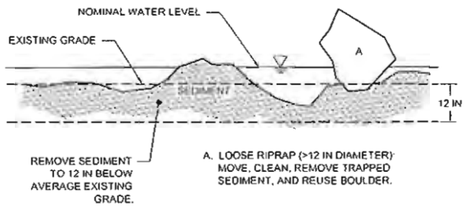
DESIGNED:	MTM
DRAWN:	CFS
CHECKED:	DJ
PROJECT ENGINEER:	DJ
APPROVED BY:	MF
DATE:	3/10/2010

BOEING
URS

SIZE	PLATE:
D	C-5

SHEET: 7 OF 13

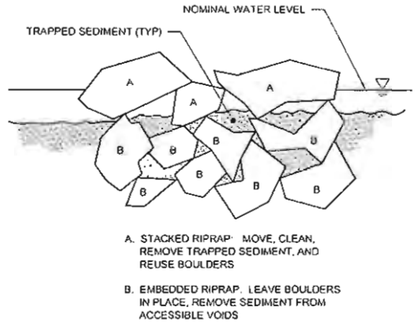
NO.	DATE	BY	REVISION DESCRIPTION



SEDIMENT AND LOOSE RIPRAP

SCALE: NTS

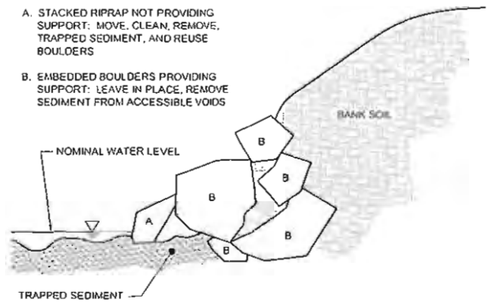
4
C-5



STACKED AND EMBEDDED RIPRAP

SCALE: NTS

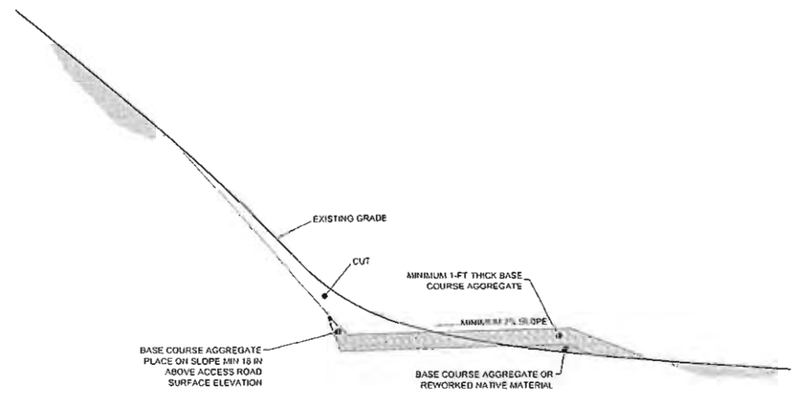
5
C-5



BANK RIPRAP

SCALE: NTS

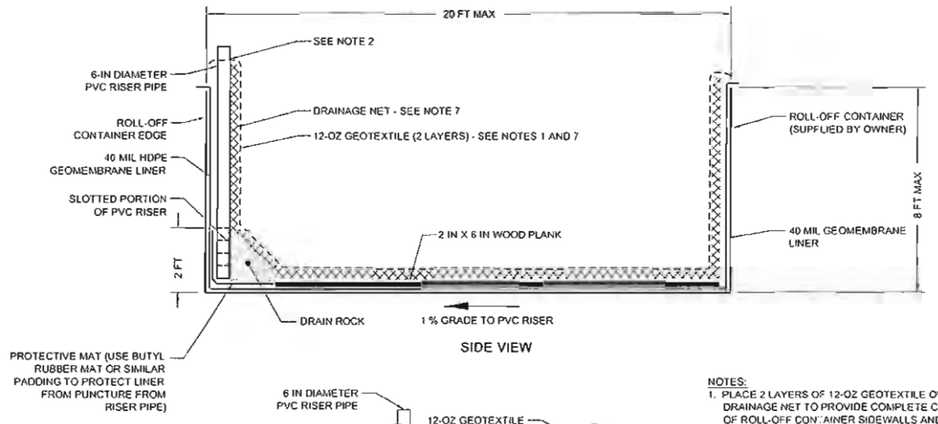
6
C-5



CROSS SECTION A ACCESS ROAD

SCALE: NTS

A
C-2



ROLL-OFF SEDIMENT STORAGE UNIT

SCALE NTS

7
C-5

NOTES:
1. PLACE 2 LAYERS OF 12-OZ GEOTEXTILE OVER DRAINAGE NET TO PROVIDE COMPLETE COVERAGE OF ROLL-OFF CONTAINER SIDEWALLS AND BOTTOM.
2. CUT HOLE IN DRAINAGE NET AND FILTER FABRIC AT TOP OF CONTAINER FOR PENETRATION OF PVC RISER PIPE. CUT HOLE TO FIT
3. PLACE ROLL-OFF CONTAINER ON GRADE OR ON SHIMS TO DIRECT DRAINAGE TOWARD 6 IN PVC RISER AND GRAVEL.
4. USE MINIMUM 20 CY ROLL-OFF CONTAINERS. DO NOT EXCEED MAXIMUM DIMENSIONS SHOWN.
5. ROLL-OFF CONTAINERS SHALL BE LINED WITH A 40 MIL GEOMEMBRANE AND PLACED WITHIN SECONDARY CONTAINMENT AREA DURING SEDIMENT STORAGE AND DEWATERING.
6. COVER CONTAINER WITH TARPAULIN AND SECURE DURING SEDIMENT STORAGE.
7. DEPAC™ DEWATERING FILTERS MANUFACTURED TO FIT ROLL-OFF STORAGE UNITS MAY BE SUBSTITUTED FOR DRAINAGE NET AND 12 OZ GEOTEXTILE COMPONENTS SHOWN.

SELECT LEGEND

UNDISTURBED SURFACE

TRAPPED SEDIMENT

DRAINAGE NET

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

SEDIMENT REMOVAL AND CREEK ACCESS ROAD DETAILS

DESIGNED: MTM
DRAWN: CFS
CHECKED: DJH
PROJECT ENGINEER: DJH
APPROVED BY: MTM
DATE: 3/10/2006

BOEING
URS

SIZE: D
PLATE: C-6
SHEET: 8 OF 13

FILENAME: G:\env\Boeing\Everett\Design\Powder Mill Creek\C-6 SED REMOVE.dwg
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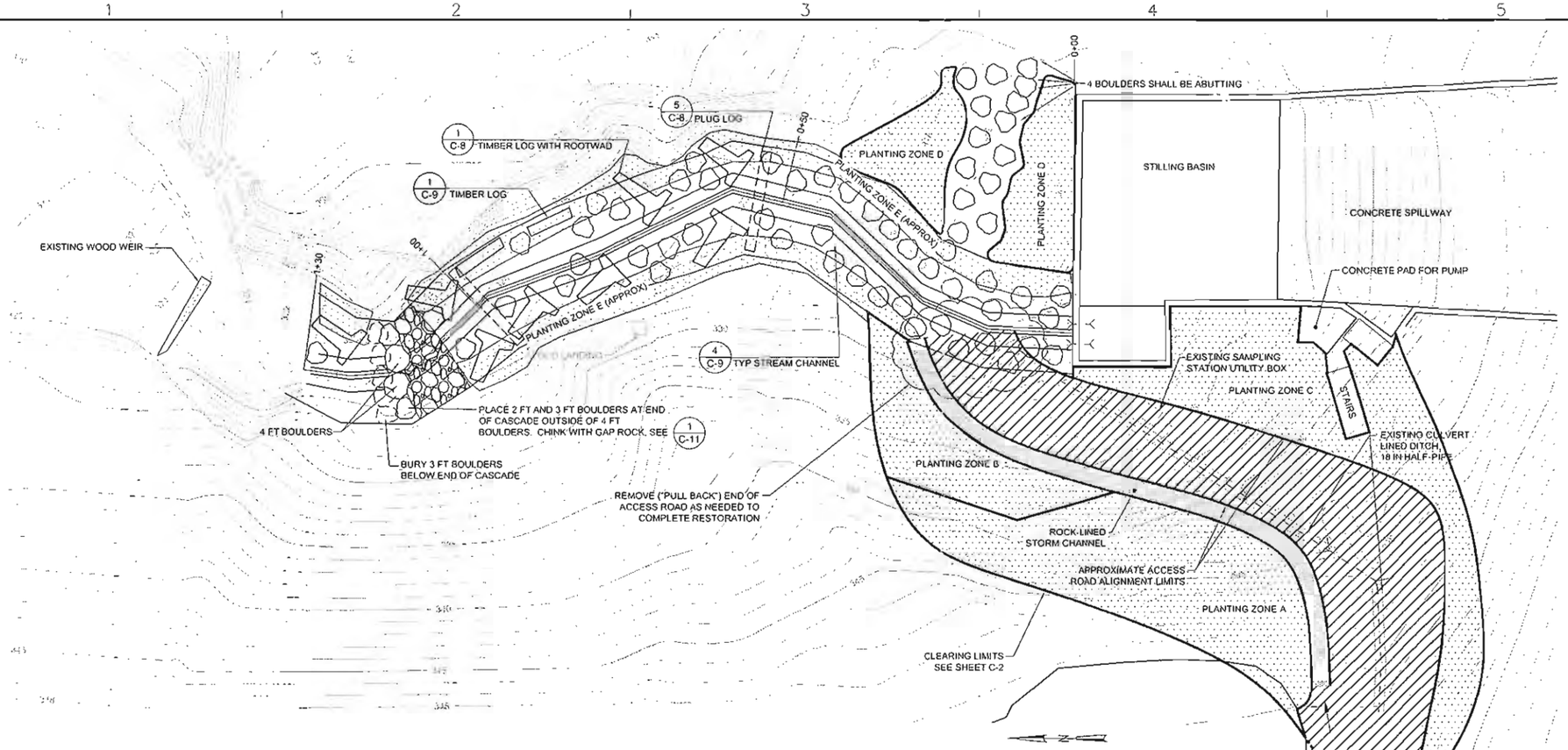
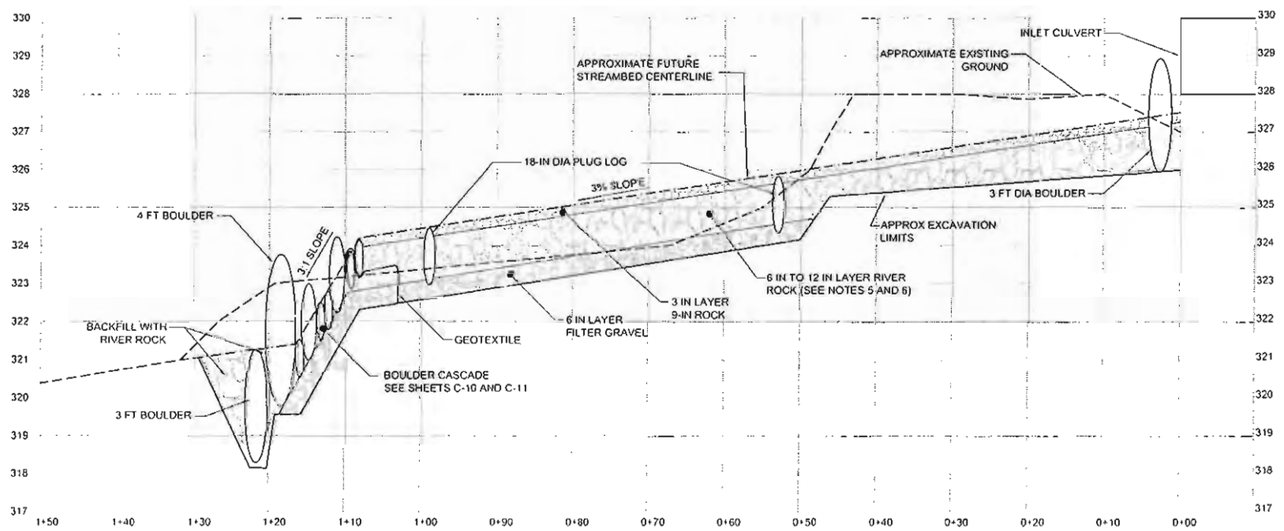


STREAMBED STABILIZATION & REVEGETATION PLAN



STREAMBED PROFILE

NO.	DATE	BY	REVISION DESCRIPTION

SELECT LEGEND

- BOULDER
- ROOTWAD
- LOG
- BOULDER CASCADE
- PLANTING ZONES
- ACCESS ROAD
- DRAINAGE DITCH
- OUTLET PIPE
- 9-INCH ROCK
- FILTER GRAVEL
- RIVER ROCK
- UNDISTURBED SURFACE

CREEK CONSTRUCTION NOTES.

1. FINAL LOCATION OF ALL LOGS AND BOULDERS WILL BE SUBJECT TO REVISION BY THE ENGINEER DUE TO ON-SITE CONDITIONS.
2. CONTRACTOR SHALL AVOID EXCAVATING INTO EXISTING STEEP BANKS. CHANNEL CENTERLINE LOCATION MAY BE ADJUSTED TO ACCOMODATE EXISTING CONDITIONS.
3. IN AREA DOWNSTREAM OF STILLING BASIN, WHERE BOULDERS ARE NOT ABUTTING, THE SPACE BETWEEN THEM SHALL BE LESS THAN THE MINIMUM DIMENSION OF THE ADJACENT BOULDERS.
4. PLACE COLLECTED AND CLEANED RIPRAP AS DIRECTED APPROXIMATE LOCATIONS ARE SHOWN. ONLY ON SITE RIPRAP SHALL BE USED; NO ADDITIONAL RIPRAP IS REQUIRED.
5. WHERE EXCAVATION SUBGRADE IS EMBEDDED RIPRAP, CHANNEL SHALL BE FORMED OF A MINIMUM 6 IN THICKNESS RIVER ROCK WITH A 3 IN FINISHING (TOP) LAYER OF 9-INCH ROCK TO FILL INTERSTICES.
6. WHERE SUBGRADE IS BARE SOIL, CHANNEL SHALL BE FORMED OF A MINIMUM 12 IN THICKNESS RIVER ROCK WITH A 3 IN FINISHING (TOP) LAYER OF 9-INCH ROCK TO FILL INTERSTICES.

STREAM CENTERLINE			
STATION	NORTHING	EASTING	ELEV +/- 0.1 FT
0+00	344,959.09	1,286,482.93	327.5
0+12.7	344,971.82	1,286,483.50	327.1
0+23.6	344,981.75	1,286,487.83	326.8
0+42.6	344,995.58	1,286,500.82	326.2
0+57.7	345,010.27	1,286,504.40	325.7
0+80.3	345,030.57	1,286,494.50	325.1
0+97.7	345,046.94	1,286,488.54	324.5
1+13.8	345,058.38	1,286,477.23	322.3
1+23.0	345,067.59	1,286,476.49	321.2
1+30.0	345,074.52	1,286,477.41	321.0

PLANTING NOTES:

1. PLANTING SHALL BE DONE IN THE FALL (OCTOBER-NOVEMBER) TO ALLOW PLANT ESTABLISHMENT PRIOR TO THE ONSET OF THE WET SEASON
2. PLANTINGS SHALL BE WATERED BY HAND DURING INSTALLATION
3. PROTECT PLANTS AT ALL TIMES DURING PLANTING OPERATION TO PREVENT ROOTS FROM DRYING OUT. NO PLANTING IS TO BE DONE DURING FREEZING WEATHER OR OTHER HIGHLY UNFAVORABLE CONDITIONS
4. PLANTS SHALL BE HEALHTY, VIGOROUS, AND WELL-FORMED, WITH WELL DEVELOPED, FIBROUS ROOT SYSTEMS, FREE FROM DEAD BRANCHES OR ROOTS. PLANTS SHALL BE FREE FROM DAMAGE CAUSED BY TEMPERATURE EXTREMES, LACK OR EXCESS OF MOISTURE, INSECTS, DISEASE, AND MECHANICAL INJURY. PLANTS IN LEAF SHALL BE WELL FOLIATED AND OF GOOD COLOR. PLANTS SHALL BE HABITUATED TO OUTDOOR ENVIRONMENTAL CONDITIONS (HARDENED OFF)
5. PLANT NAMES SHALL CONFORM TO *FLORA OF PACIFIC NORTHWEST* BY HITCHCOCK AND CRONQUIST, UNIVERSITY OF WASHINGTON PRESS, 1973
6. SUBSTITUTION OF PLANT MATERIALS NOT ON THE PROJECT LIST WILL NOT BE PERMITTED UNLESS AUTHORIZED IN WRITING BY THE ENGINEER
7. PLANTING ZONE B - PLANT OPPORTUNISTICALLY (WHERE SPACE AVAILABLE IN RIP-RAP) AND IN A RANDOM PATTERN (NOT IN ROWS)
8. PLANTING ZONE E - PLANT OPPORTUNISTICALLY (WHERE SPACE AVAILABLE) AND IN A RANDOM PATTERN (NOT IN ROWS) AFTER CONSTRUCTION OF STREAM CHANNEL AND PLACED LOGS AND BOULDERS
9. LIVE STAKES (CUTTINGS) SHALL BE INSTALLED SO THAT AT LEAST ONE-HALF OF THEIR LENGTH IS IN THE SOIL
10. LIVE STAKES ARE 2 FT LONG AND NOT LESS THAN 0.5 IN DIAMETER
11. ROLLED EROSION CONTROL MATS SHALL BE INSTALLED IN ALL PLANTING ZONES PER SPECIFICATION
12. ALL PLANTING ZONES SHALL BE HYDROSEEDED PER SPECIFICATION

QUANTITY	COMMON NAME	SCIENTIFIC NAME	SIZE	SPACING
PLANTING ZONE A				
10	Big-leaf maple	*Acer macrophyllum*	1 GAL	3 FT OC
15	Red alder	*Alnus rubra*	1 GAL	3 FT OC
10	Douglas-fir	*Pseudotsuga menziesii*	1 GAL	3 FT OC
PLANTING ZONE B				
40	Scouler willow	*Salix scouleriana*	2 FT live stake	Opportunistically amongst riprap
PLANTING ZONE C - HYDROSEED ONLY				
PLANTING ZONE D				
15	Salmonberry	*Rubus spectabilis*	1 GAL	clusters of 3, each cluster 3 FT OC
10	Western redcedar	*Thuja plicata*	1 GAL	3 FT OC
PLANTING ZONE E				
xx	Sitka willow	*Salix sitchensis*	2 FT live stakes	Opportunistically approx 3 FT OC

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

CREEK RESTORATION PLAN AND PROFILE

DESIGNED: [redacted]
DRAWN: JRK
CHECKED: DS
PROJECT ENGINEER: [redacted]
APPROVED BY: MMH
DATE: 3/10/2008

BOEING
URS

SIZE: D
PLATE: C-7
SHEET: 9 OF 13

PLOTTED: Fri, Mar 14, 2008 - 09:34
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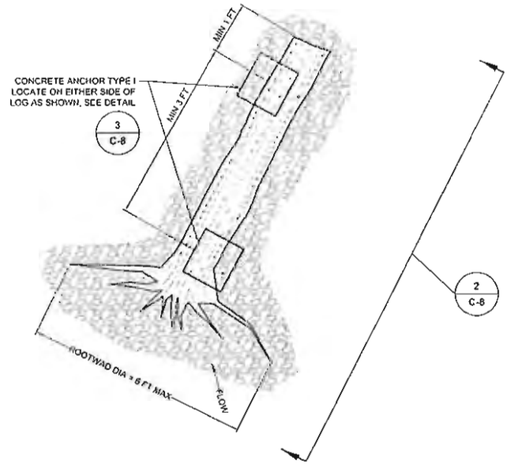
NO.	DATE	BY	REVISION DESCRIPTION

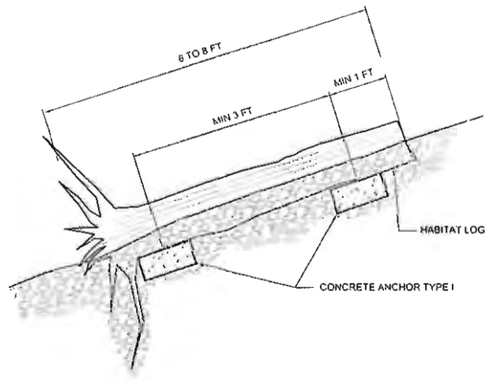


ROOTWAD PLAN

1

C-7

NTS

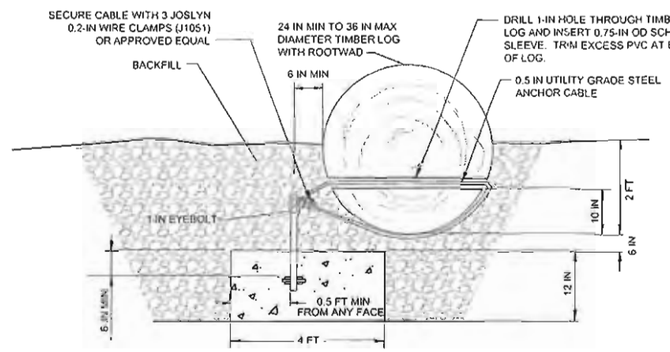


ROOTWAD SECTION

2

C-8

NTS

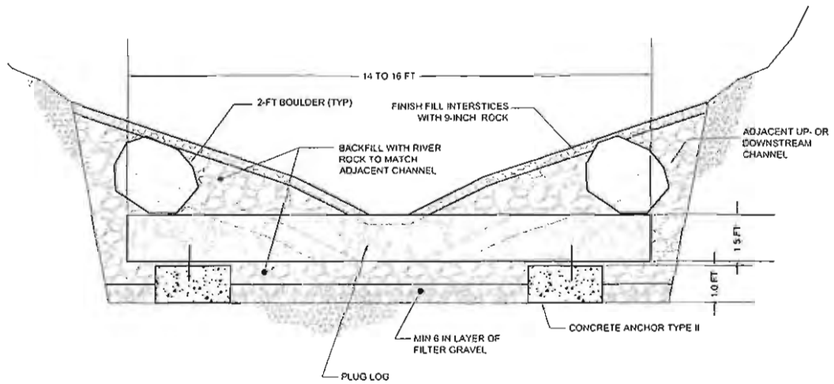


CONCRETE ANCHOR TYPE II

3

C-8

NTS

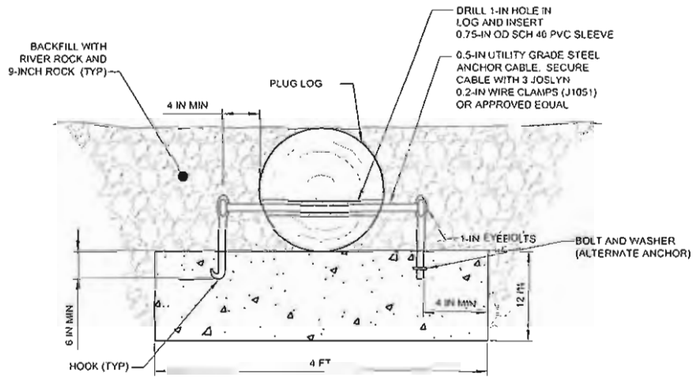


PLUG LOG SECTION (TYP)

4

C-7

NTS



CONCRETE ANCHOR TYPE II

5

C-8

NTS

SELECT LEGEND:

- 9-INCH ROCK
- FILTER GRAVEL
- RIVER ROCK
- UNDISTURBED SURFACE

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

STREAM CHANNEL CONFIGURATION

DESIGNED:	SF
DRAWN:	JRK
CHECKED:	DS
PROJECT ENGINEER:	SF
APPROVED BY:	MPM
DATE:	4/19/2006

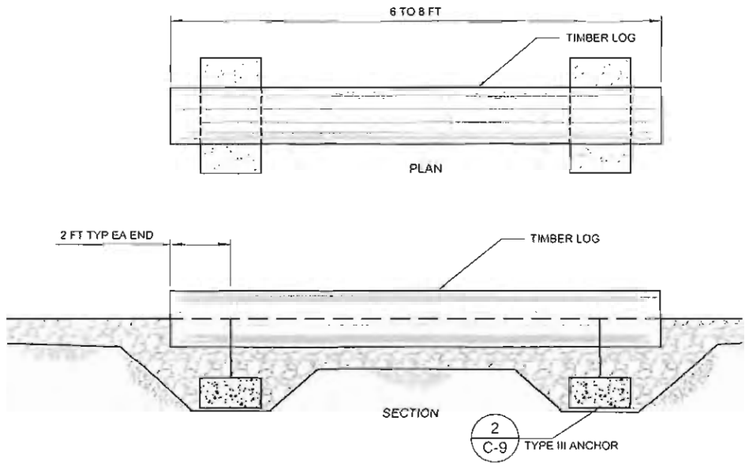
BOEING
URS

SIZE	PLATE
D	C-8

SHEET
10 OF 13

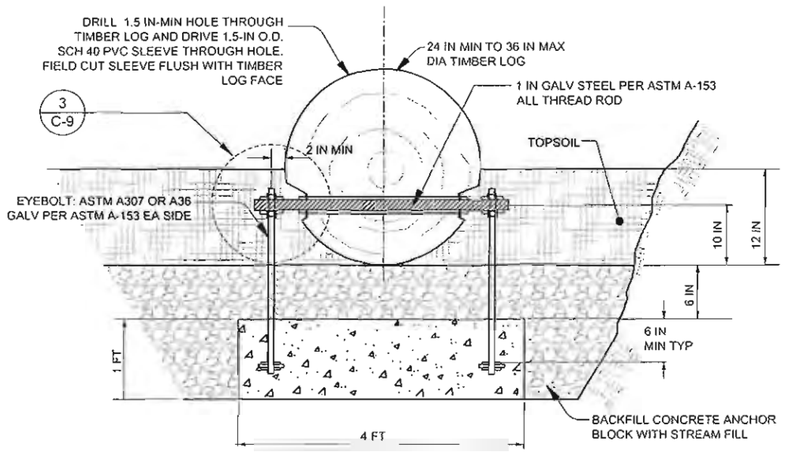
FILENAME: D:\pw\Documents\Everett Design\Plate VIII - Details\C-8 STREAM CHANNEL.dwg
EDIT DATE: 04/20/06

NO.	DATE	BY	REVISION DESCRIPTION



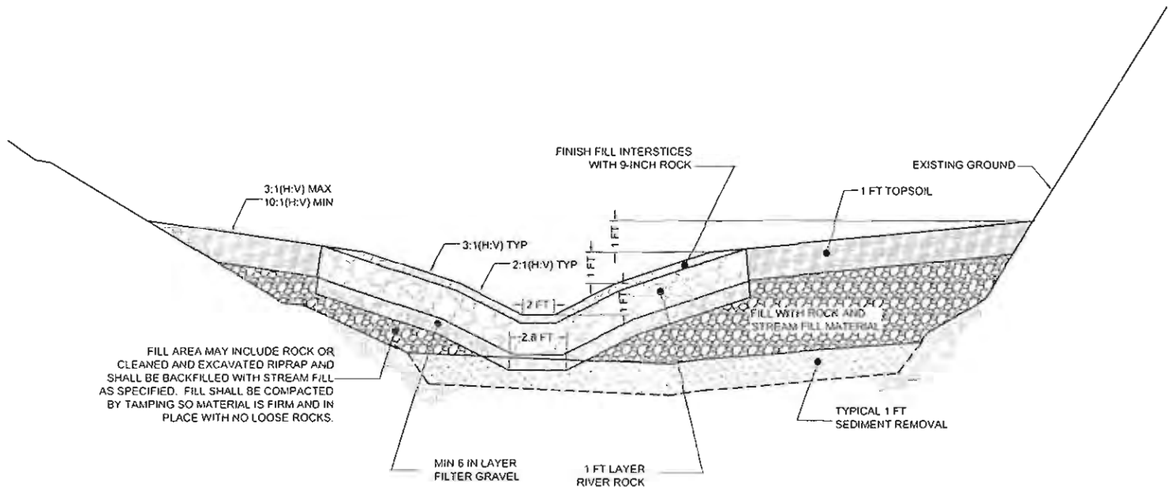
LOG DETAIL 1 C-7

NTS



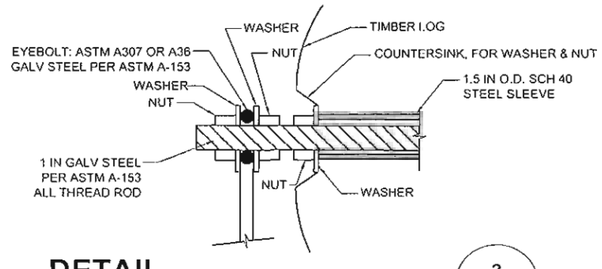
CONCRETE ANCHOR TYPE III 2 C-9

NTS



TYPICAL FILL CHANNEL CROSS SECTION 4 C-7

NTS



DETAIL 3 C-9

NTS

SELECT LEGEND:

- FILTER GRAVEL
- RIVER ROCK
- UNDISTURBED SURFACE
- TOPSOIL

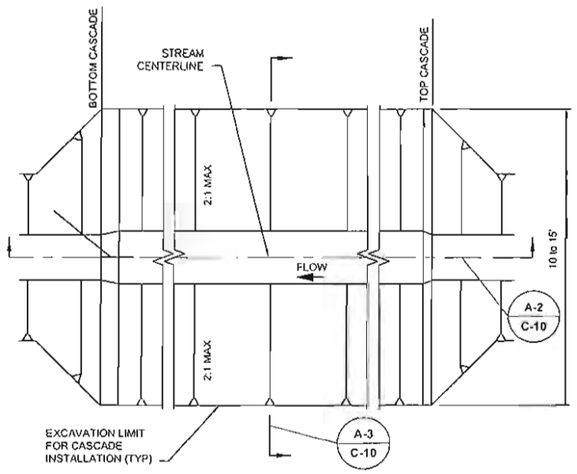
PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

BANK STABILIZATION DETAILS

DESIGNED: SF	BOEING	SIZE	PLATE
DRAWN: JRK	URS	D	C-9
CHECKED: DB		SHEET	
PROJECT ENGINEER: SF		11 OF 13	
APPROVED BY: MPM			
DATE: 3/10/2006			

STEP A

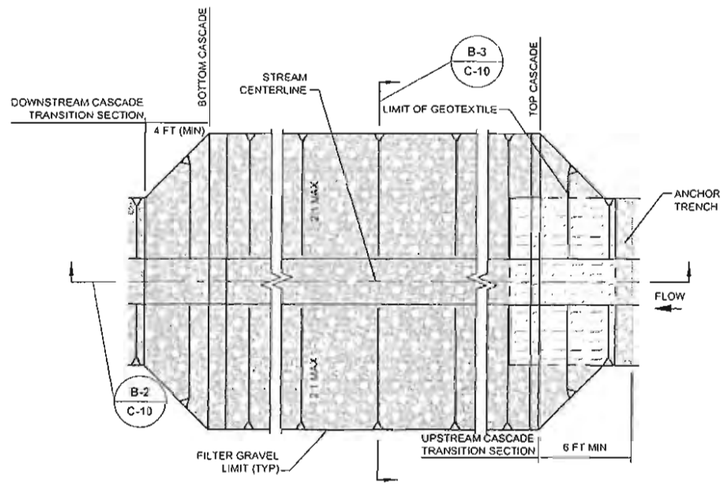


CASCADE ROUGH GRADING PLAN

A-1 / C-10

NTS

STEP B

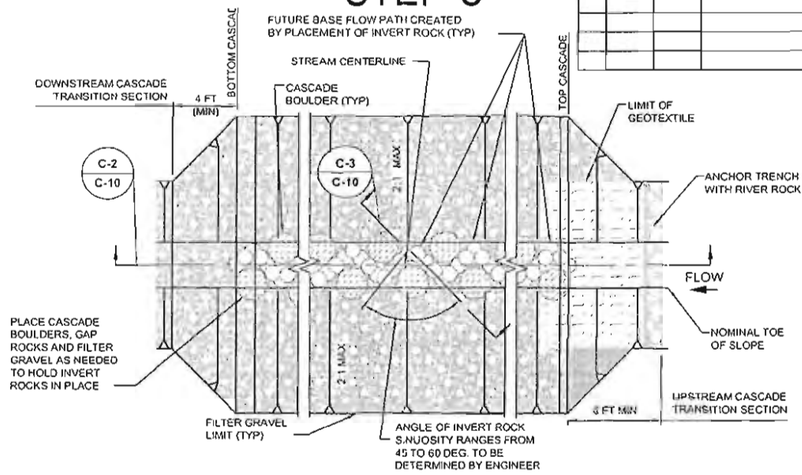


FILTER GRAVEL PLAN

B-1 / C-10

NTS

STEP C



INVERT ROCK PLACEMENT PLAN

C-1 / C-10

NTS

NO.	DATE	BY	REVISION DESCRIPTION

GENERAL NOTES:

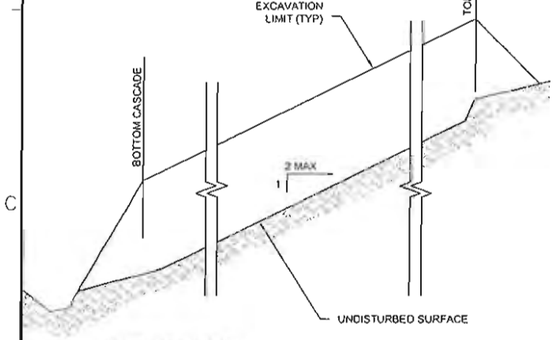
1. CONTRACTOR SHALL EXCAVATE TO THE NEAT GRADES AND LINES SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER. ALL SURFACES THAT ARE TO RECEIVE PLACEMENT OF CASCADE MATERIALS SHALL BE UNDISTURBED. SOILS DISTURBED BELOW GRADES SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER SHALL BE REPAIRED PRIOR TO PLACEMENT OF CASCADE MATERIALS

   IF, IN THE OPINION OF THE ENGINEER, THE DISTURBED NATIVE SOILS ARE SUITABLE, THESE MATERIALS SHALL BE COMPACTED TO SPECIFIED GRADES AND LINES. IF THE MATERIALS ARE NOT SUITABLE, THE CONTRACTOR SHALL SUPPLY AND INSTALL ADDITIONAL FILTER GRAVEL TO THE SPECIFIED GRADES AND LINES.

   COMPACTION SHALL BE FIRM AND IN PLACE WITH NO LOOSE ROCKS. BOULDERS SHALL BE CHINKED TO SATISFACTION OF ENGINEER.

2. BASE FLOW PATH TO BE LAID OUT BY ENGINEER. CONTRACTOR SHALL ADJUST ROCKS TO PREVENT FLOW DIVISION FROM POOL

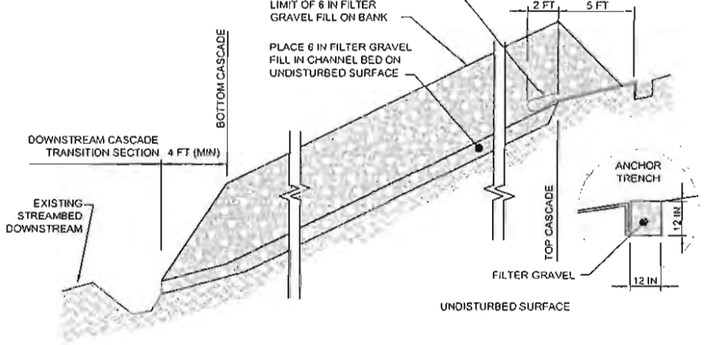
3. THE OBJECT IS TO CREATE A BASE FLOW PATH USING STEP POOLS APPROX. 8 IN DEEP WITH POOL SURFACE APPROX. 12 IN x 12 IN.



SECTION

A-2 / C-10

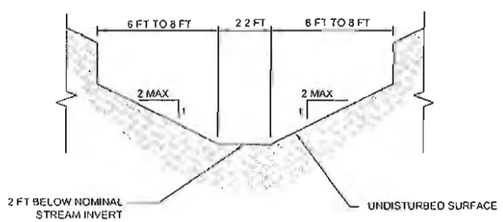
NTS



SECTION

B-2 / C-10

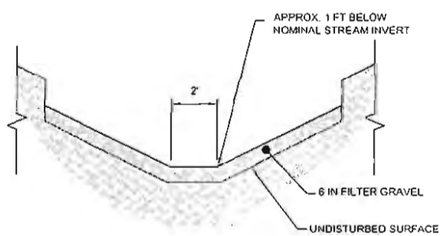
NTS



SECTION

A-3 / C-10

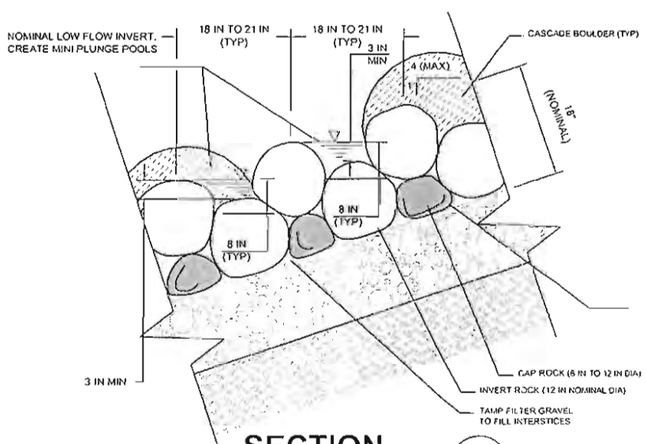
NTS



SECTION

B-3 / C-10

NTS



SECTION

C-3 / C-10

NTS

SELECT LEGEND:

- GAP ROCK 6 TO 12 IN DIA
- WATER SURFACE
- INVERT ROCK 12 IN DIA
- CASCADE BOULDER 24 IN DIA
- FILTER GRAVEL
- UNDISTURBED SURFACE
- RIVER ROCK
- EXPOSED GEOTEXTILE

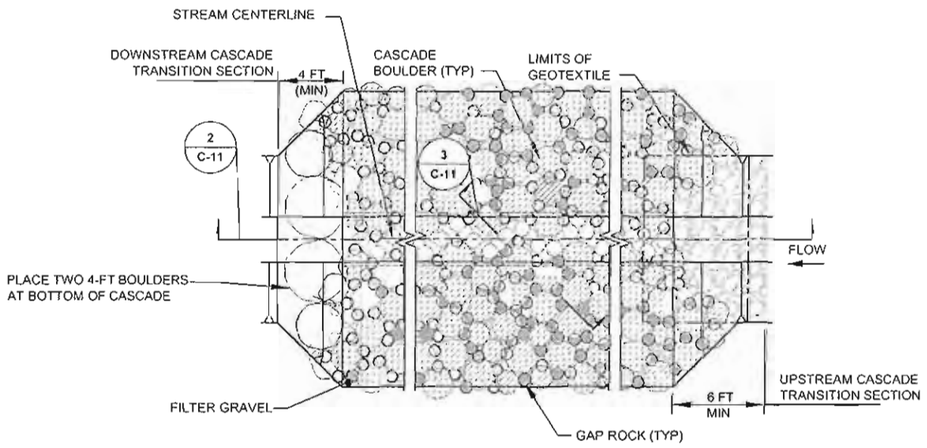
PRELIMINARY NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

BOULDER CASCADE DETAILS 1

DESIGNED: SF DRAWN: JRK CHECKED: OS PROJECT ENGINEER: SF APPROVED BY: MPM DATE: 3/10/2006	BOEING URS	SIZE: D	PLATE: C-10
		SHEET: 12 OF 13	

STEP D



CASCADE BOULDER PLACEMENT PLAN 1 C-11

0 5 10
SCALE IN FEET

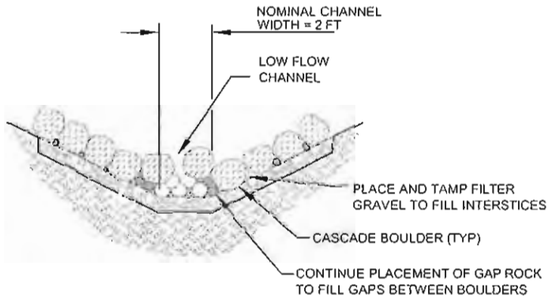
BOULDER CASCADE NOTES:

1. BASE FLOW PATH TO BE LAID OUT BY ENGINEER. CONTRACTOR SHALL ADJUST ROCKS TO PREVENT FLOW DIVISION FROM POOL TO POOL
2. OBJECT IS TO CREATE A BASE FLOW PATH USING STEP POOLS APPROX. 8 IN DEEP WITH POOL SURFACE APPROX 12 IN x 12 IN.
3. THE CASCADE PLACEMENT PLANS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. THE CONTRACTOR SHALL NOT RELY ON THESE ILLUSTRATIONS TO CALCULATE OR ESTIMATE MATERIAL QUANTITIES.

SELECT LEGEND

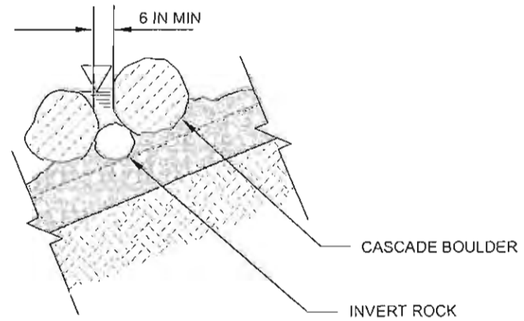
- D — GAP ROCK 6 TO 12 IN DIA
- INVERT ROCK 12 IN DIA
- CASCADE BOULDER 24 IN DIA
- FILTER GRAVEL
- RIVER ROCK
- UNDISTURBED SURFACE

NO.	DATE	BY	REVISION DESCRIPTION



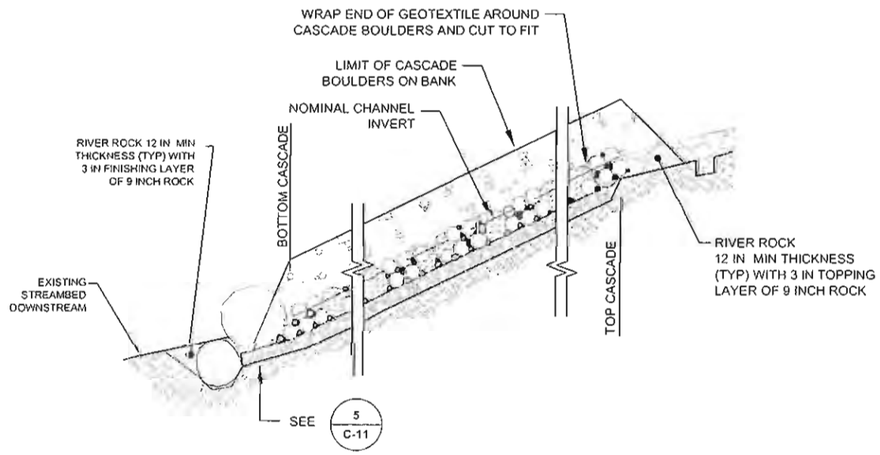
SECTION 3 C-11

0 5 10
SCALE IN FEET



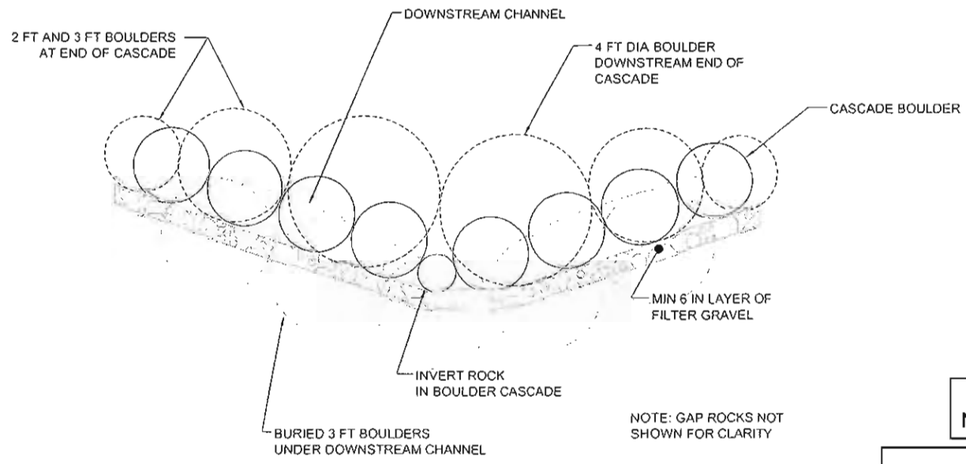
SECTION 4 C-11

0 2 4
SCALE IN FEET



SECTION 2 C-11

0 5 10
SCALE IN FEET



NOTE: GAP ROCKS NOT SHOWN FOR CLARITY

CHANNEL AND CASCADE LOOKING DOWNSTREAM 5 C-11

0 2 4
SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION

BOEING COMMERCIAL AIRPLANES
POWDER MILL CREEK SEDIMENT REMOVAL
EVERETT, WASHINGTON

BOULDER CASCADE DETAILS 2

DESIGNED: SF	BOEING URS	SIZE: D	PLATE: C-11
DRAWN: JRK			
CHECKED: DS		SHEET: 13 OF 13	
PROJECT ENGINEER: SF			
APPROVED BY: MPM			
DATE: 3/10/2005			

FILENAME: D:\proj\design\Everett\Design\Powder Mill Creek\C-11 BOULDER 2.dwg
ET DATE: JAN 04, 09
AT: 10:06